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THE ART AND SCIENCE
OF
STAIR BUILDING.

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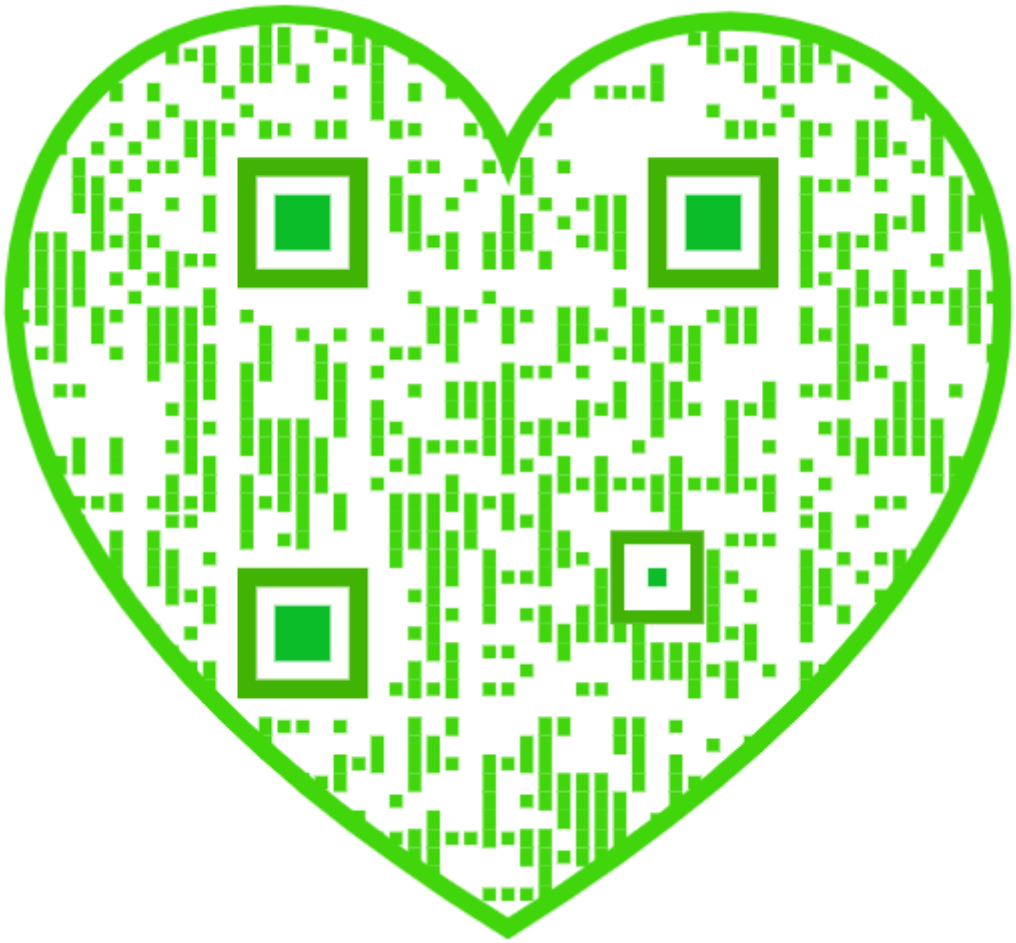

THE

ART AND SCIENCE

OF

STAIR BUILDING.

BY THE AUTHOR OF

"CARPENTERS' AND BUILDERS' ASSISTANT," "AMERICAN STAIR BUILDERS' GUIDE." AND "STEEL SQUARE PROBLEMS."

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Illustrated by Thirty-six Engraved Plates.

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PREFACE.

It has been the object of the author of this work, which he now presents to the public for their inspection, to reduce the art and science of Stair Building to the shortest and most simple system of lines which will reach the end desired. He has confidence in believing that it will be favorably received, and that the contents are the most valuable and the price the lowest of any work which has been published.

L. D. GOULD.

Plate 1

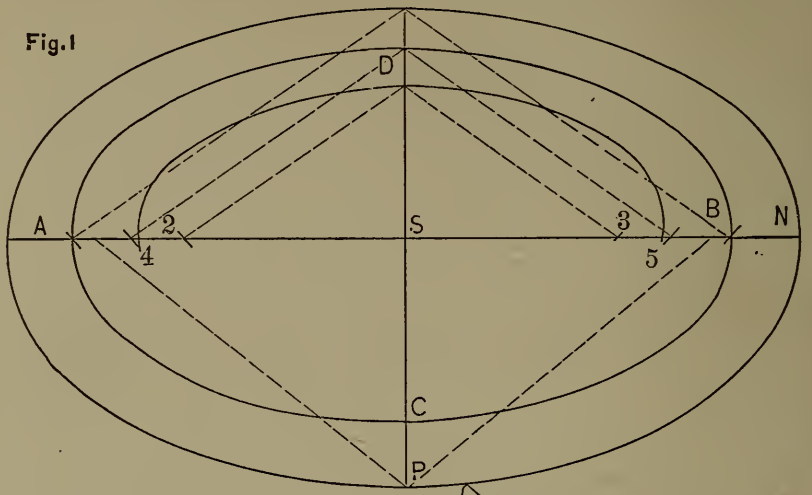
Fig.1
D
A
2
S
3
B
N
4
5
C
P

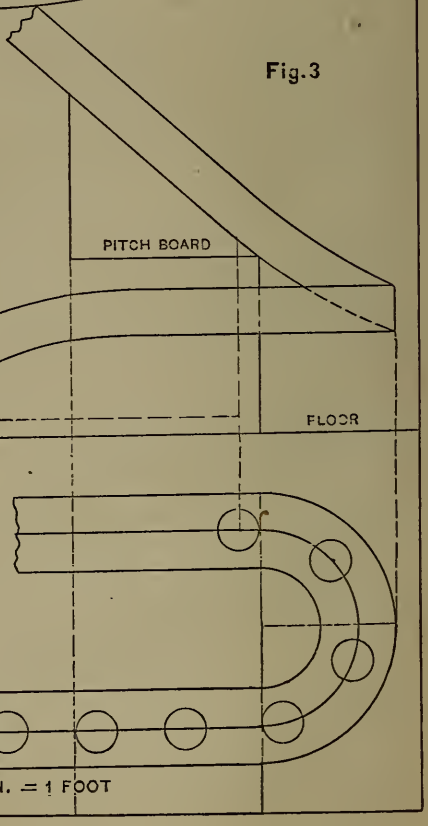
Fig.3
PITCH BOARD
FLOOR
3
Fig.2
PITCH BOARD
2
FLOOR
SCALE 1 IN. = 1 FOOT

PLATE I.

Fig. 1. *To describe an elliptical curve with a thread or cord and pencil.*

Draw the major and minor axis A B and C D, Fig. 1. To find the points to place pins : From the point D as a centre, with S B or S A as a radius, describe arcs, cutting the major axis in the points 2 and 3 ; place pins in the points, and, by the use of thread or cord and pencil, describe the elipse required. Care should be taken to keep the thread or cord to an even tension. Suppose the curve to be the centre of a mould required for a hand-rail : Set off each way from the point D equal half the width of rail ; from the points draw parallel to D 2 and D 3, cutting the major axis in the points for pins to describe the outside and inside curves.

To find the points for pins to describe a curve parallel to A C B : Set off from C to P equal B N ; from the point P as a centre, with S N as a radius, describe arcs cutting the major axis in the points 4 and 5 ; place pins and describe the curve required.

Fig. 2 exhibits a plan and elevation of handrail at the starting. To find the easing and points to bore for balusters : Set up from 2 to 3 on the pitch-board, equal the difference in the heights of newel post and short baluster ; square over for the newel cap ; mark from the pitch-board for the point to bore for baluster.

To continue the height of rail at the starting to its termination, care should be taken to measure the rise from the points to bore for balusters, as shown by the dotted lines, Fig. 3.

Plate 2

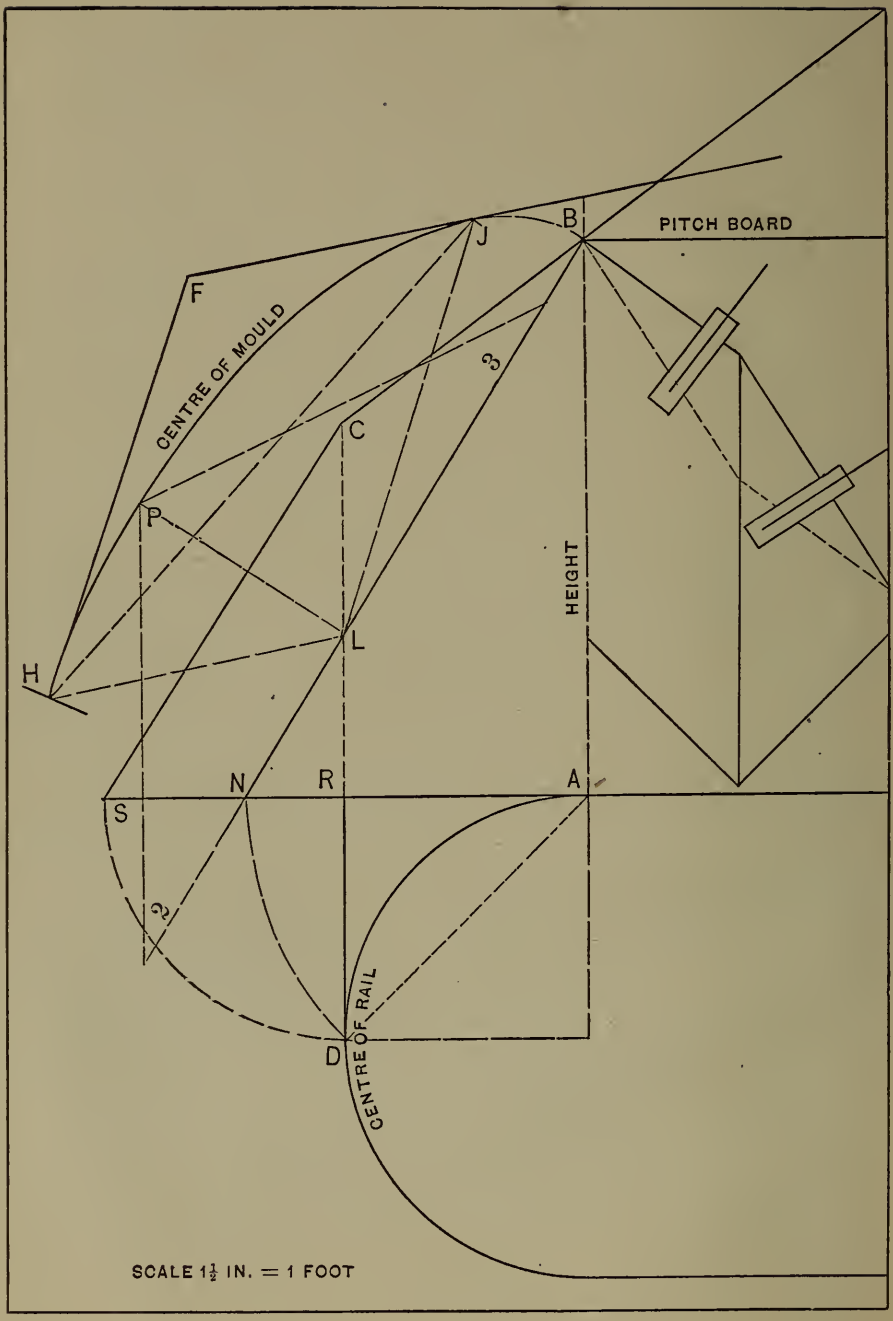
PITCH BOARD
B
J
F
CENTRE OF MOULD
3
C
P
HEIGHT
L
H
N
R
A
S
2
CENTRE OF RAIL
D
SCALE 1½ IN. = 1 FOOT

PLATE II

Exhibits rules for finding the major axis of the elliptical curves, the point of contact, and the length of curve required for the mould. Also, a practical rule for finding the vertical and horizontal lines to bevel the plank to form the wreath.

To find the major axis of the elliptic curve for centre of mould : Set up from A to B equal the rise of rail from D to A ; from the point B draw the common pitch B C ; join B N and C S ; square up from L to P, equal A R. Then L B equals half the major, and L P equals half the minor axis of the elliptic curve required.

To find the points for pins : From the point P as a centre, with L B as a radius, describe arcs cutting the major axis in 2 and 3. By the use of thread or cord and pencil, describe the curve for centre of mould.

To find the length of curve and point of contact : From the point L as a centre, with C B as a radius, describe an arc cutting the curve in H ; from the point H as a centre, with N B as a radius, describe an arc cutting the curve in J ; then J is the point of contact, and H J equals the length required.

To find the direction of the straight rail : From the points H and J as centres, with S C and B C as radius, describe arcs cutting each other in F ; join H F and F J extended for the direction required.

To find the vertical angles to bevel the plank : Fit a piece to the tangents R A and R D ; draw the pitch C B on the side R A, and the pitch C S on the side R D. Cut to the marks and apply the bevel as shown for the angles required.

The above rules contain all the science required to construct handrails for any staircase that may be designed, by anyone that has acquired the use of tools.

Plate 3

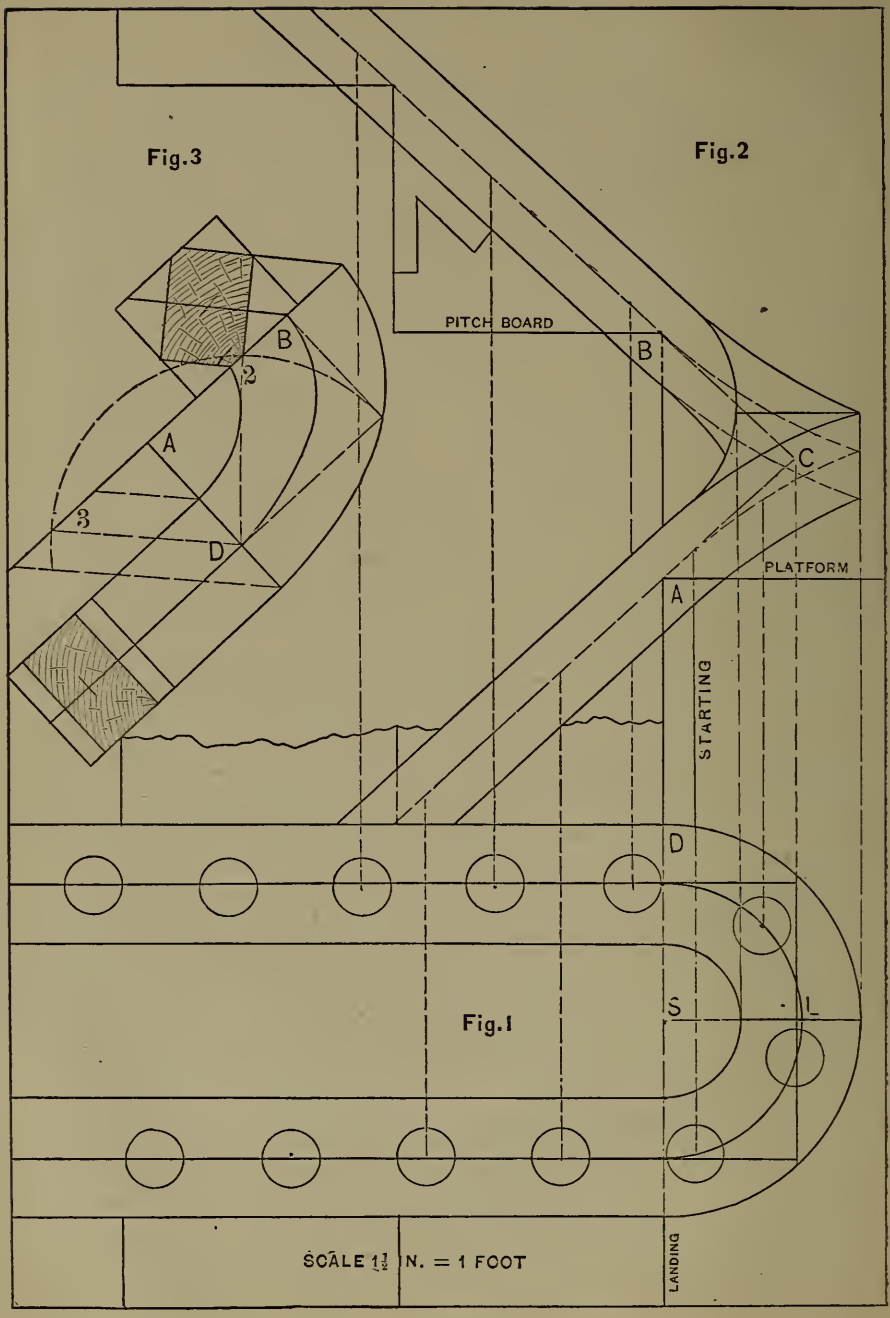
Fig.3
Fig.2
PITCH BOARD
B
B
2
A
3
D
C
PLATFORM
A
STARTING
D
S
L
Fig.1
SCALE 1½ IN. = 1 FOOT
LANDING

PLATE III

Exhibits the plan for a platform stairs, where the radius of circle for the centre of rail equals half the width of step.

To draw the elevation of the handrail, Fig. 2 : Square up from D to A and B equal two (2) risers ; place the pitch-board at A and B ; draw the common pitch A C and B C ; drop a line from C parallel to B D ; then S L, Fig. 1, equals the radius of semicircle for the centre of rail on the plan.

To draw the mould, Fig. 3 : Square up from A to D equal S L, Fig. 1 ; set off from A to B equal A C, Fig. 2 ; from the point D as a centre, with A B as a radius, describe an arc cutting the major axis in the points 2 and 3 ; place pins in the points ; by the use of thread or cord and pencil, describe the centre curve ; set off each way from D equal half the width of rail ; from the points describe the outside and inside curves. The pitch-board equals the angle for the vertical cuts at the joint B.

The rule applies to larger circles, by placing the risers half the width of step from the centre of rail.

Plate 4

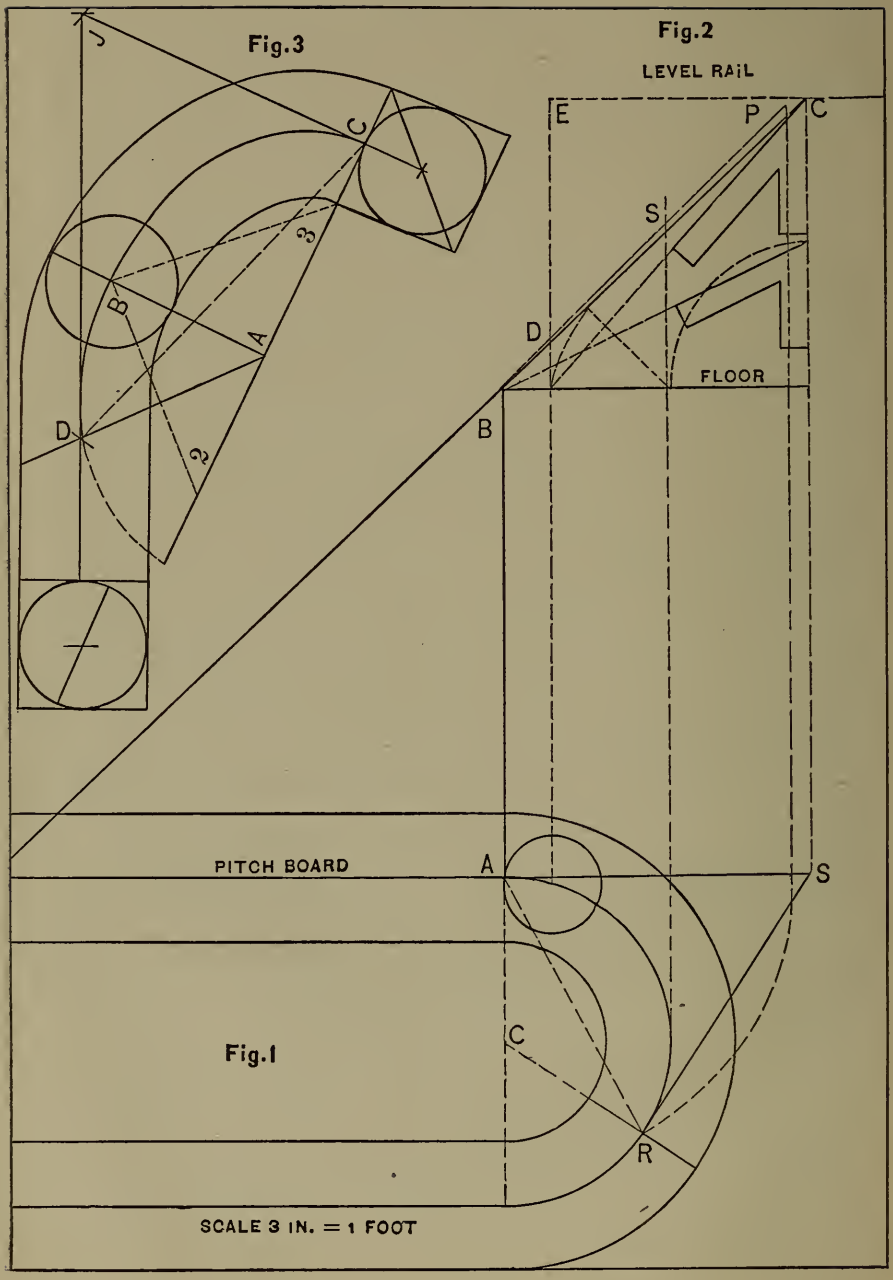
Fig.3
J
C
3
B
A
D
2
Fig.2
LEVEL RAIL
E
P
C
S
D
FLOOR
B
PITCH BOARD
A
S
Fig.1
C
R
SCALE 3 IN. = 1 FOOT

PLATE IV

Exhibits the plan of a round rail, on a four-inch cylinder at the landing.

To find the length of curve required for the easing or wreath : Square up from A to B equal the riser ; from the centre of baluster, draw D E equal half the riser ; draw E C at right angles to E D ; join C S parallel to B A ; join S R, Fig. 1, equal S A. Then A R equals the length of curve required.

To find the vertical and horizontal sides of the wreath : Fit a piece to the tangents S A and S R, Fig. 1 ; draw the pitch B C, Fig. 2, on the side S A ; square over on the side S R ; cut to the marks ; apply the bevel to the sides for the angles required.

To draw the mould, Fig. 3 : Square up from A to B, equal C A, Fig. 1 ; Set off from A to C and from B to 2 and 3, equal B S, Fig. 2 ; place pins in the points 2 and 3 ; by the use of thread or cord and pencil, describe the centre curve.

To find the length of curve and the direction of straight rail : From the point C as a centre, with B P, Fig. 2, as a radius, describe an arc cutting the curve in D, the point required ; from the points D and C as centres, with S R, Fig. 1, and B C, Fig. 2, as radii, describe arcs cutting each other in J ; draw C J and J D the direction required ; set off each way from C and D equal half the width of rail ; from the points, describe the outside and inside curves ; cut the joints at right angles to the tangents and face of plank.

Plate 5

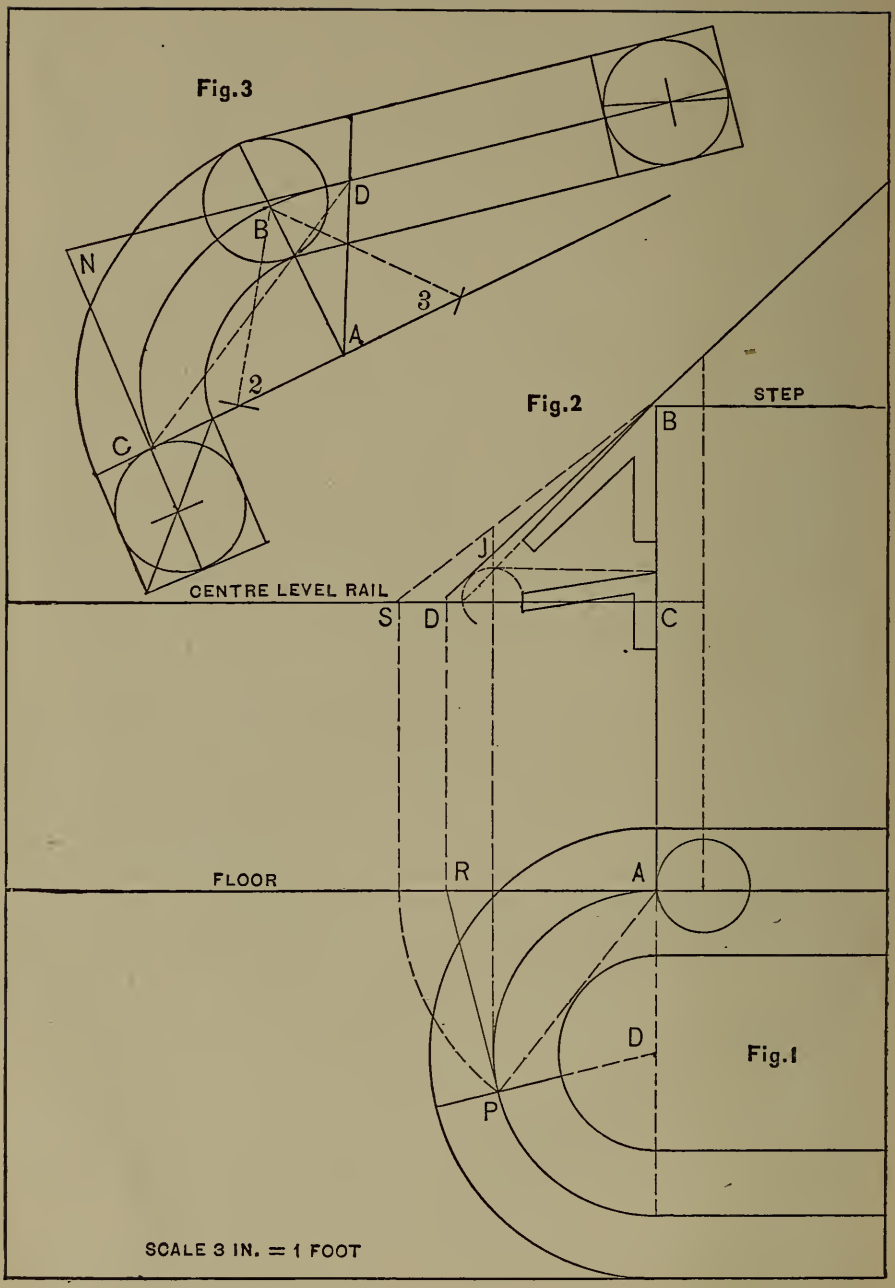
Fig.3
N
B
D
A
3
2
C
Fig.2
STEP
B
J
CENTRE LEVEL RAIL
S
D
C
FLOOR
R
A
D
P
Fig.1
SCALE 3 IN. = 1 FOOT

PLATE V

Exhibits the plan of a round rail on a four-inch cylinder, at the starting of the second flight.

To find the length of curve required for the easing or wreath : Square up from A to B equal one riser ; from the point B, draw the common pitch ; set up from A to C equal half the riser, and the rise of the rail from the riser to the point to bore for the baluster for the centre of level rail ; draw D R parallel to B A, and R P equal R A. Then A P equals the length of curve required.

To find the vertical and horizontal sides of the wreath : Fit a piece to the angle of the tangents R A and R P, Fig. 1; square over on the side R P ; draw the pitch D B on the side R A ; cut to the marks ; apply the bevel to the sides for the angles required.

To draw the mould, Fig. 3 : Square up from A to B equal A D, Fig. 1 ; from the point B as a centre, with B J, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3 ; place pins in the points ; by the use of thread or cord and pencil, describe the centre curve.

To find the length of curve and point of contact : From the point C as a centre, with B S, Fig. 2, as a radius, describe an arc cutting the curve in the point D.

To find the direction of the straight rail : From the points C and D as centres, with A R, Fig. 1, and D B, Fig. 2, as radii, describe arcs cutting each other in N ; join C N and N D the direction required ; set off each way from C and B equal half the width of rail ; from the points, describe the outside and inside curves.

Plate 6

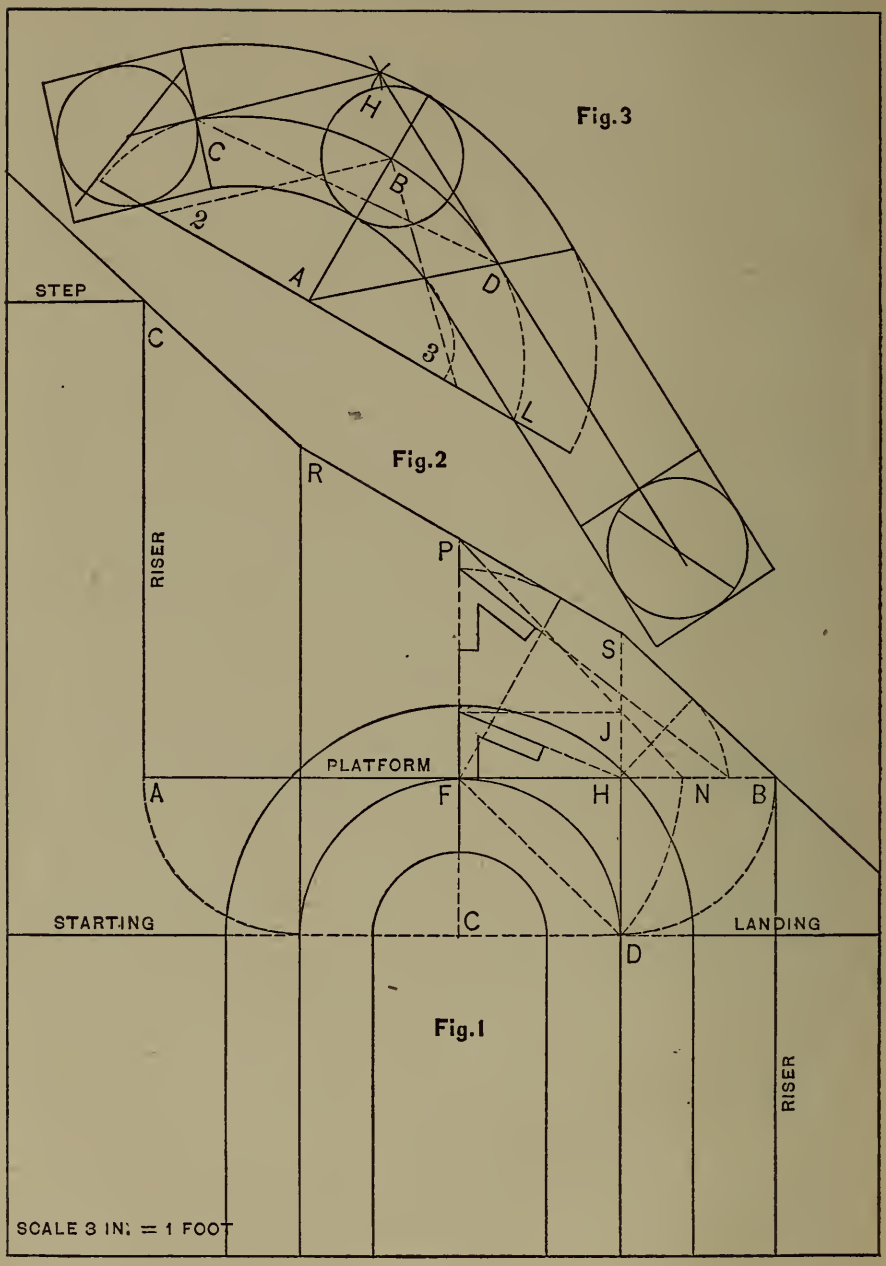
Fig.3
H
C
B
2
A
D
3
L
STEP
C
Fig.2
R
RISER
P
S
J
PLATFORM
A
F
H
N
B
STARTING
C
LANDING
D
Fig.1
RISER
SCALE 3 IN. = 1 FOOT

PLATE VI

Exhibits the plan of a round rail for a platform stairs, on a four-inch cylinder.

To draw the elevation of the tangents : Square up from A to C equal the riser ; from the points B and C draw the common pitch to S and R.

To find the vertical and horizontal sides of the wreath : Fit a piece to the angle of the tangents F H D, Fig. 1 ; draw the pitch B S on the side D H, and the pitch S P on the side H F ; cut to the marks ; apply the bevel to the sides for the angles required.

To draw the mould, Fig. 3 : Square up from A to B equal C D, Fig. 1 ; set off from A to L, and from B to 2 and 3 equal P J, Fig. 2 ; place pins in the points 2 and 3 ; by the use of thread or cord and pencil, describe the centre curve.

To find the point of contact and the length of curve : From the point A as a centre, with S P as a radius, describe an arc cutting the curve in D ; from the point D as a centre, with N P as a radius, describe an arc cutting the curve in C. Then D is the point of contact, and D C the length required.

To find the direction of the straight rail : From the points D and C as centres, with B S and P S, Fig. 2, as radii, describe arcs cutting each other in H ; join C H and H D for the direction required ; set off each way from B and L equal half the width of rail ; from the points, describe the outside and inside curves.

Plate 7

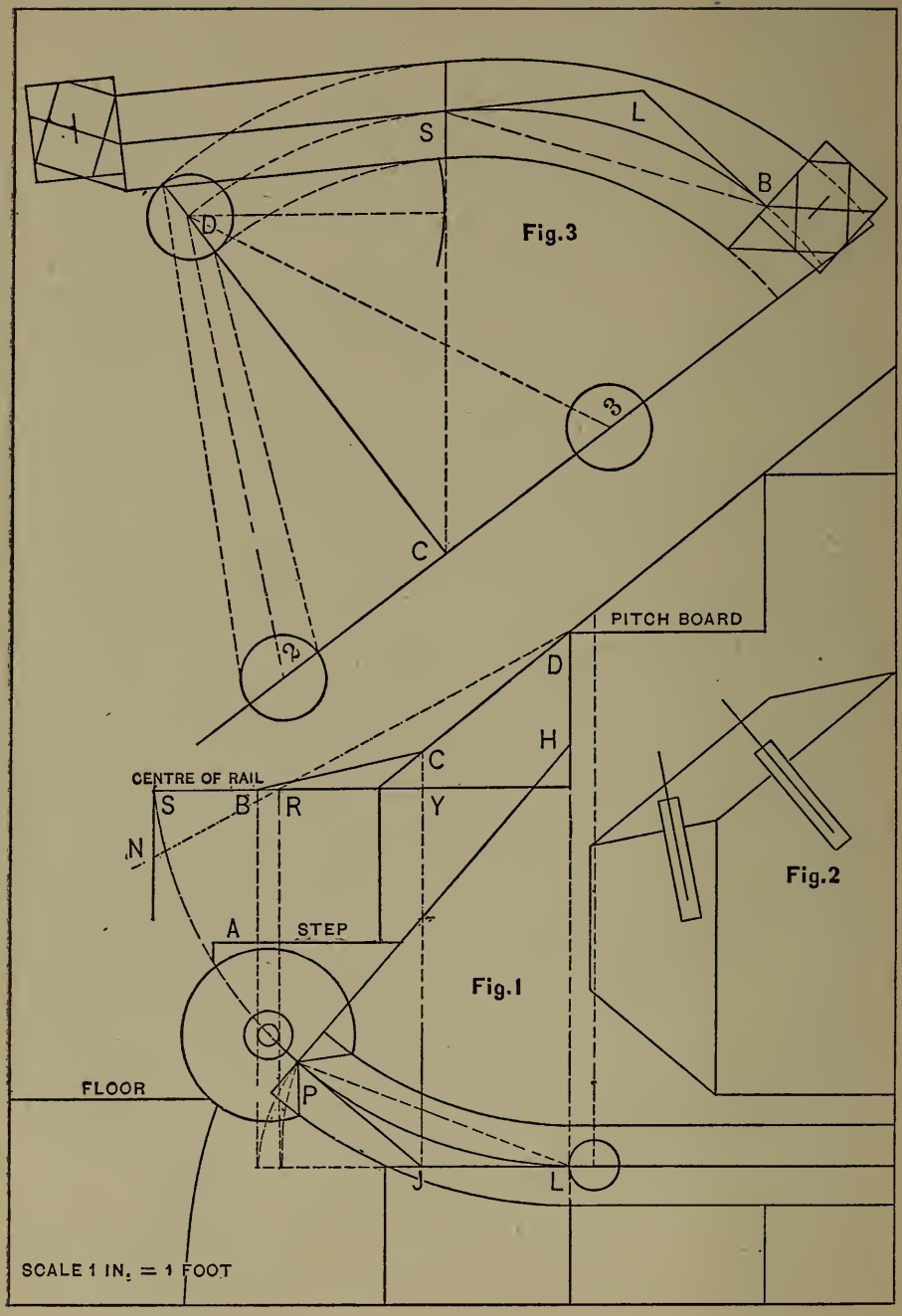
S
L
B
D
Fig.3
3
C
2
PITCH BOARD
D
H
C
CENTRE OF RAIL
S
B
R
Y
N
A
STEP
Fig.2
Fig.1
FLOOR
P
J
L
SCALE 1 IN. = 1 FOOT

PLATE VII

Exhibits a plan for turnout at the starting of a staircase.

To draw the elevation of the tangents P J L, Fig. 1 : Square up from the riser and intersection of the tangents L and J indefinitely ; from the point D, draw the common pitch D C ; Set up from A to B equal the difference in the heights of the newel-post and the short baluster, less or minus the rise of the common pitch from the riser to the point to bore for the baluster ; join B C. Then B C D equals the elevation required.

To draw the mould, Fig. 3 : Square up from C to D equal H P, Fig. 1 ; from the point D as a centre, with D N, Fig. 1, as a radius, describe arcs cutting the major axis in the points 2 and 3 ; place pins in the points ; by the use of thread or cord and pencil, describe the centre curve.

To find the point of contact : From the point D as a centre, with Y S, Fig. 1, as a radius, describe an arc ; from the point C tangent, to the arc, draw C S, cutting the curve in S, the point required.

To find the length of curve : From the point S as a centre, with D R, Fig. 1, as a radius, describe an arc cutting the curve in B, the length required.

To find the direction of the straight rail : From the points S and B as centres, with B C and D C, Fig. 1, as radii, describe arcs cutting each other in L ; draw B L, and L S the direction required ; set off each way from D equal half the width of rail ; also from the points 2 and 3 for pins to describe the outside and inside curves.

To find the vertical sides of the wreath : Fit a piece to the angle of the tangents J P and J L, Fig. 1 ; draw the pitch B C on the side P J, and the pitch C D on the side J L ; cut to the marks ; apply the bevel as shown in Fig. 2.

Plate 8

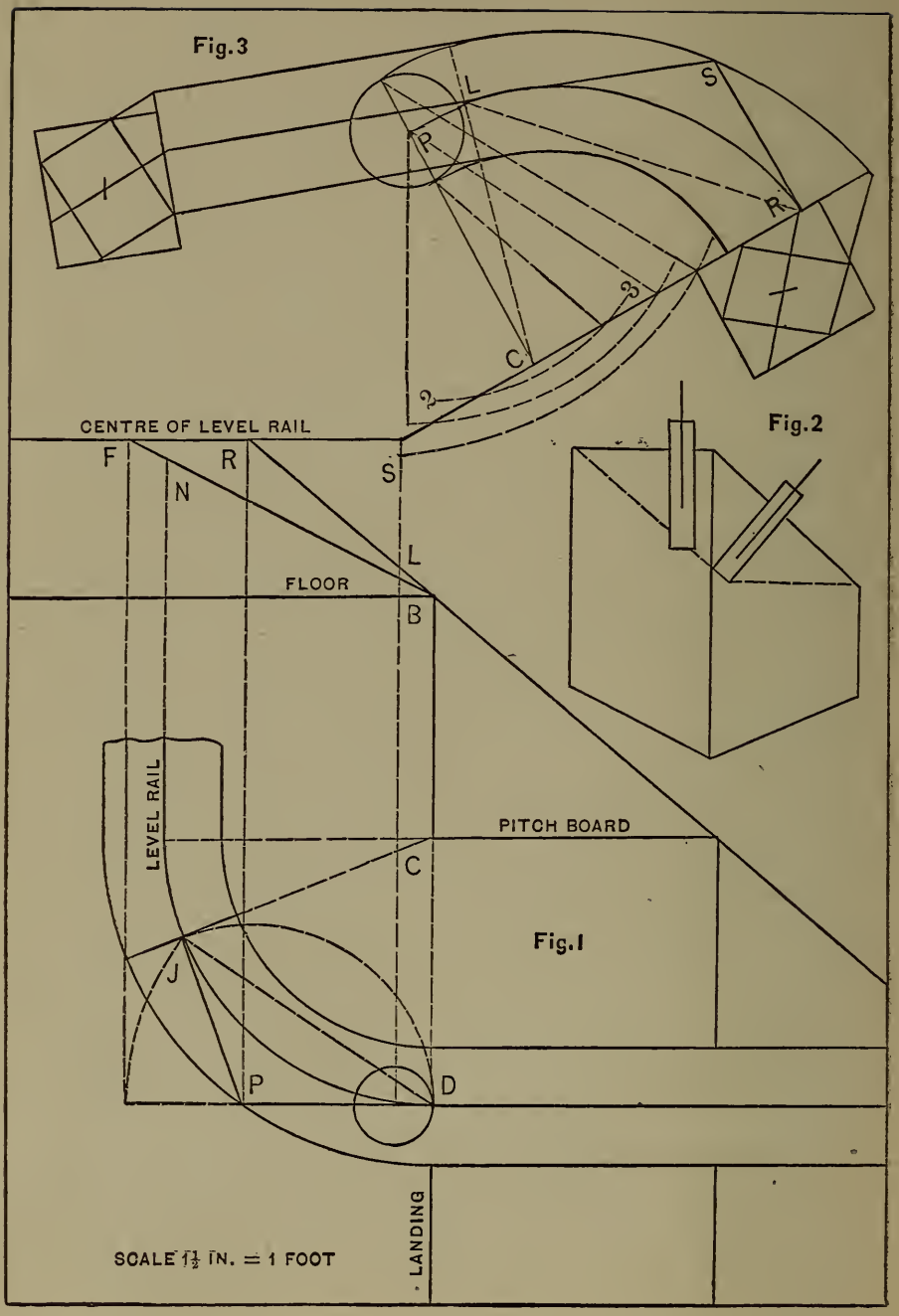
Fig.3
L
S
R
R
1
1
2
2
C
CENTRE OF LEVEL RAIL
F
R
S
N
L
FLOOR
B
Fig.2
LEVEL RAIL
PITCH BOARD
C
Fig.1
J
P
D
LANDING
SCALE 1½ IN. = 1 FOOT

PLATE VIII

Exhibits the plan of a quarter cylinder at the landing.

To find the length of curve required for the easing: Draw the common pitch from the point B indefinitely; set up from L to S equal half the riser; from the point S, draw the centre of level rail, cutting the pitch in R; draw R P parallel to B D, and P J equal P D. Then D J equals the length of curve required.

To find the vertical and horizontal sides of the easing: Fit a piece to the angle of the tangents D P J; square over on the side P J; draw the pitch R B on the side P D; cut to the marks; apply the bevel as shown in Fig. 2.

To draw the mould for the easing, Fig. 3: Square up from C to P equal C D, Fig. 1; set off from C to R, and from P to 2 and 3 equal B N, Fig. 1; with pins in the points 2 and 3, by the use of thread or cord and pencil, describe the centre curve. From the point R as a centre, with B F, Fig. 1, as a radius, describe an arc cutting the curve in L, the point of contact. From the points R and L as centres, with J P and B R, Fig. 1, as radii, describe arcs cutting each other in S; join R S and S L; set off each way from P equal half the width of rail. The bevel applied to the width of rail determines the width of mould at R.

Plate 9

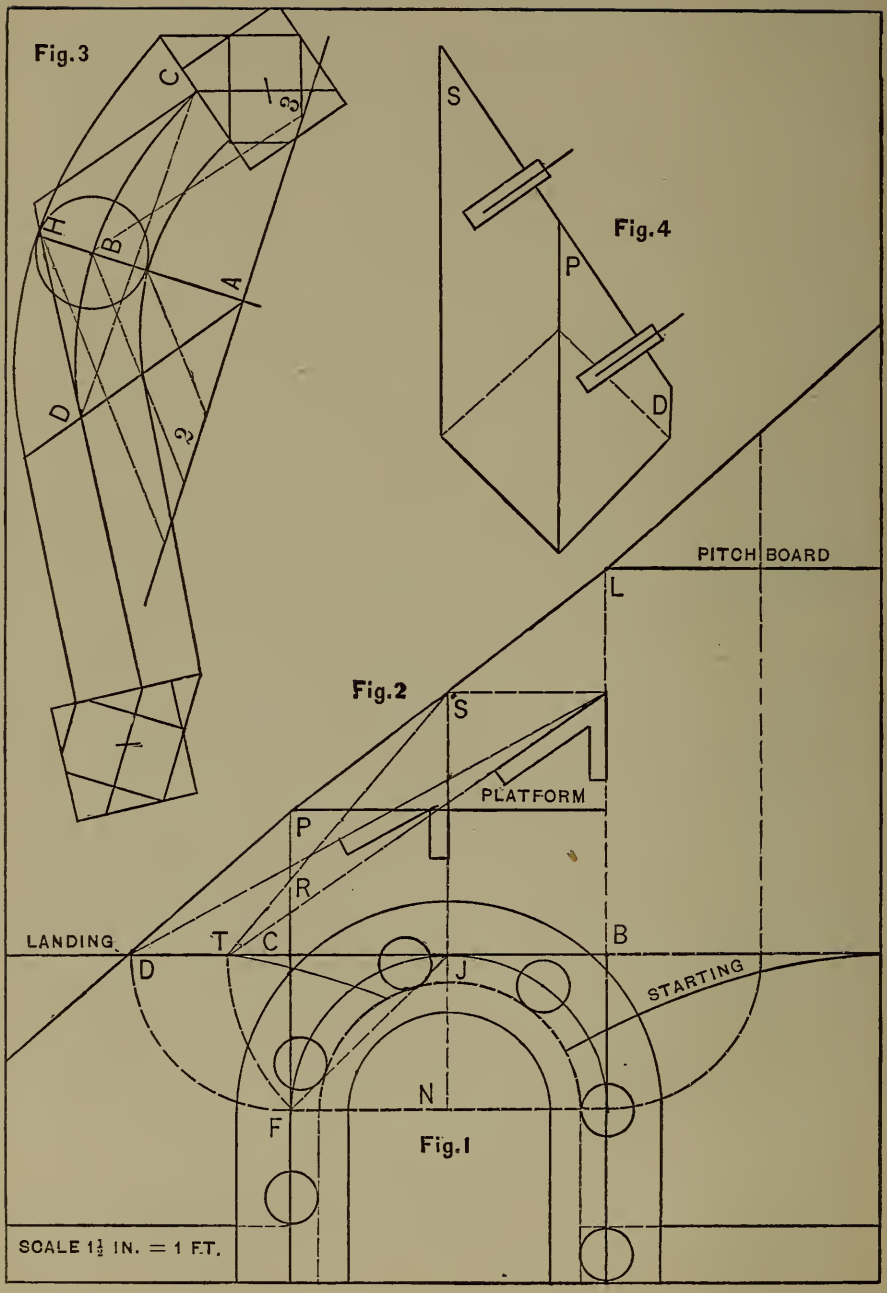
Fig.3
C
3
H
B
A
D
2
1
Fig.4
S
P
D
PITCH BOARD
L
Fig.2
S
PLATFORM
P
R
LANDING
T
C
B
D
J
STARTING
N
F
Fig.1
SCALE 1½ IN. = 1 FT.

PLATE IX

Exhibits a plan of handrail for platform stairs; the steps placed in the cylinder.

To draw the elevation of the tangents : Square up from C and B indefinitely ; from the point D draw the common pitch cutting the line from C in P ; set up from P to L equal the riser ; join P L.

To draw the elliptic curve for the centre of the mould, Fig. 3 : Square up from A to B equal N J, Fig. 1 ; from the point B as a centre, with S R, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, by the use of thread or cord and pencil, describe the centre curve ; from the point A as a centre, with P S, Fig. 2, as a radius, describe an arc cutting the curve in D ; from the point D as a centre, with S T, Fig. 2, as a radius, describe an arc cutting the curve in C ; from the points C and D as centres, with D P and S P, Fig. 2, as radii, describe arcs cutting each other in H ; join C H and D H ; set off each way from B equal half the width of rail ; from the points describe the outside and inside curves.

To find the vertical and horizontal sides of the wreath : Fit a piece to the angle of the tangents F C J, Fig. 1 ; draw the pitch D P on the side F C, the pitch P S on the side C J ; cut to the marks ; apply the bevel as shown in Fig. 4.

Plate 10

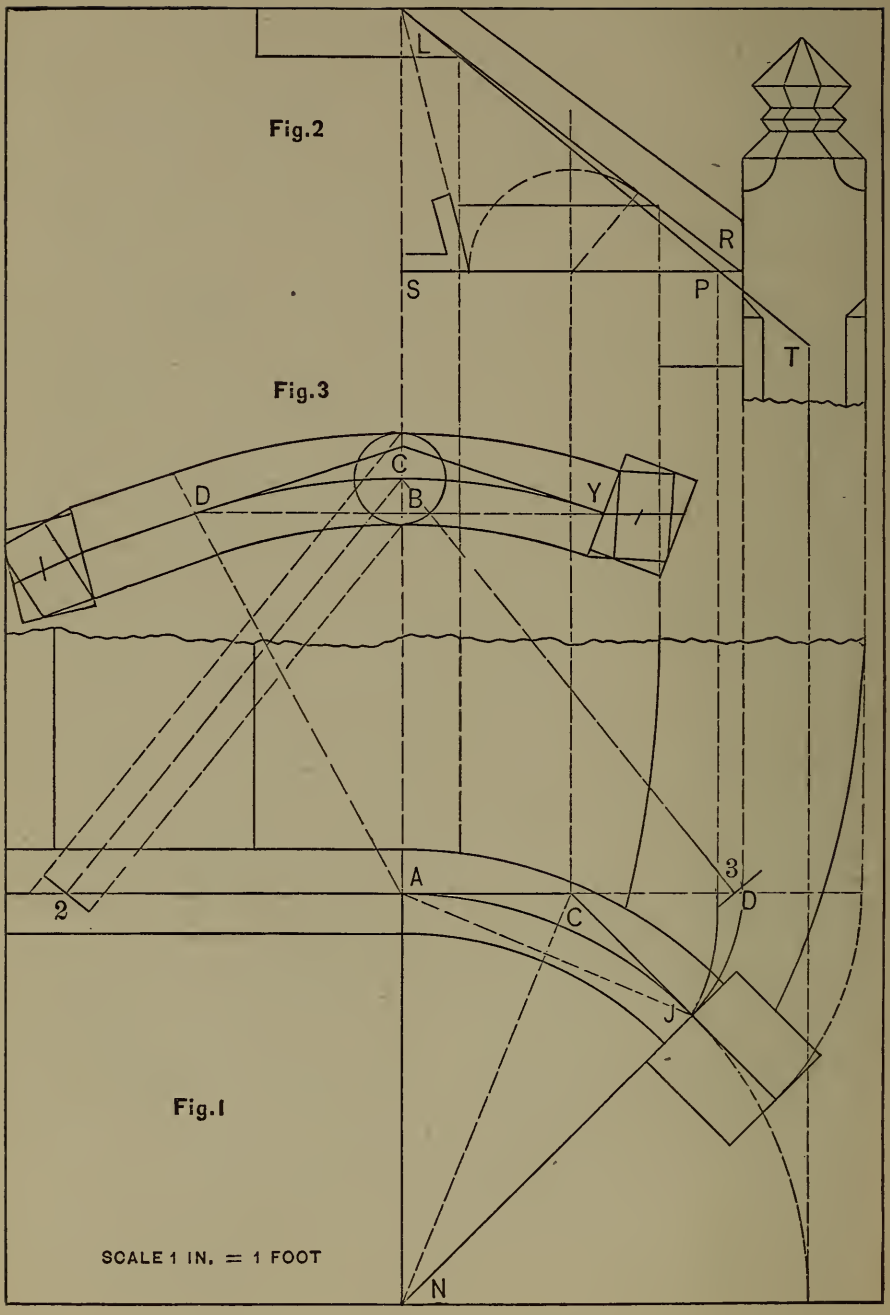

PLATE X

Exhibits a plan for turnouts, at the starting of stairs and stoops.

To draw the elevation of the rail: Square up from A C and D, Fig. 1, indefinitely; draw R L the common pitch, and R S at right angles to R D.

To find the elliptic curve for the centre of the mould, Fig. 3: Set up from A to B equal A N, Fig. 1; from the point B as a centre, with L T, Fig. 2, as a radius, describe arcs cutting the major axis in the points 2 and 3; with pins in the points, and by the use of thread or cord and pencil, describe the centre curve; set up from A to C equal N C, Fig. 1. From the point as a centre, with L R bisected as a radius, describe arcs cutting the curve in D and Y; join C Y and C D the direction of straight rail; D Y should equal L P, Fig. 2; set off each way from B equal half the width of rail; from the points describe the outside and inside curves.

To find the angle to bevel the plank for the vertical sides of the wreath: Fit a piece to the angle of the tangents A C J, Fig. 1; draw the pitch R L, Fig. 2, on the sides; cut to the marks; apply the bevel to the sides for the angle required.

Plate 11

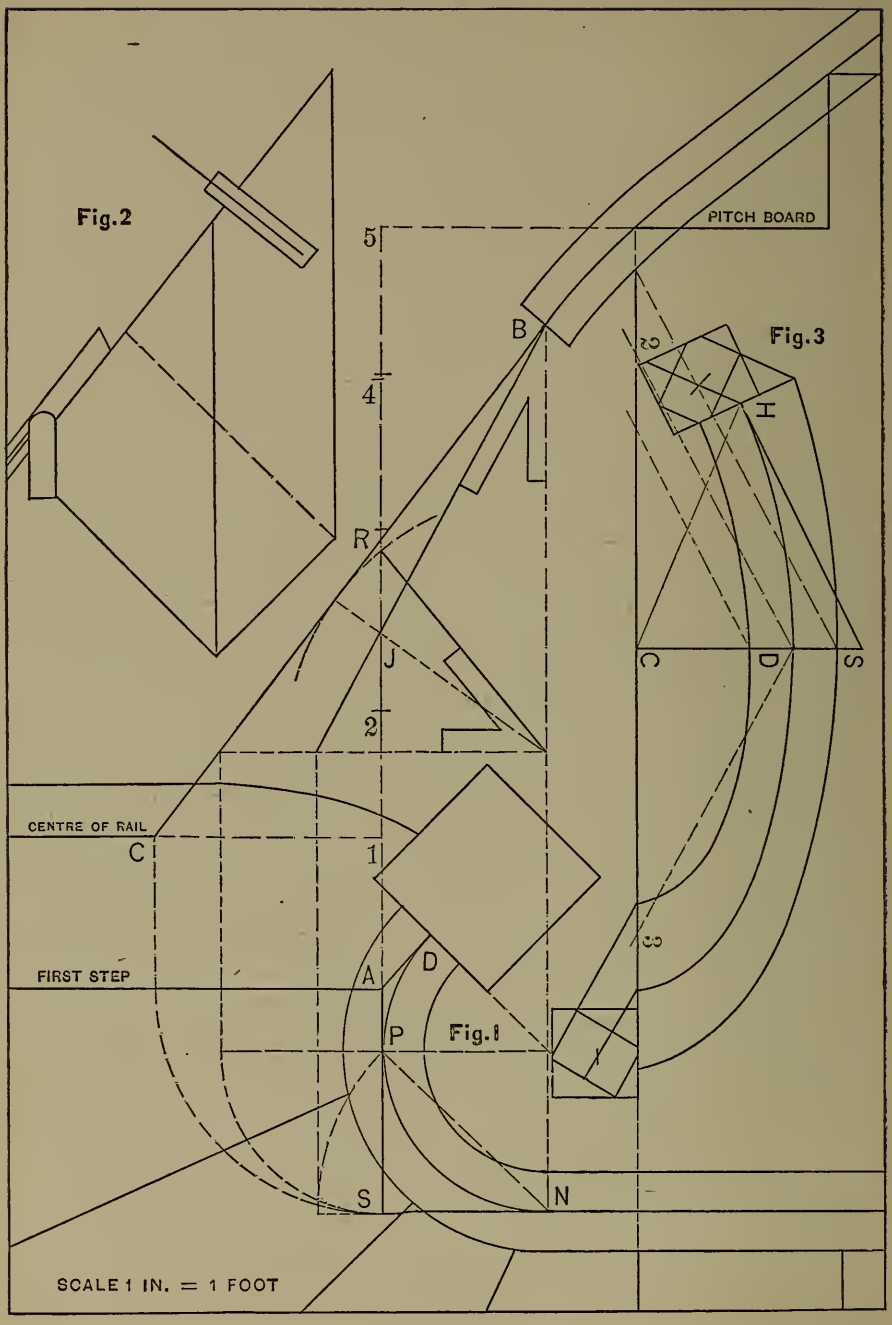
Fig.2
PITCH BOARD
Fig.3
5
4
B
R
J
2
H
C
D
S
CENTRE OF RAIL
C
1
FIRST STEP
A
D
P
Fig.1
S
N
SCALE 1 IN. = 1 FOOT

PLATE XI.

Fig. 1 *exhibits a plan of winders*, at the starting of the stairs, the wreath in one piece forming its own easing at the newel post.

To draw the elevation of handrail : Set up from A to 5 equal five risers ; place the pitch-board ; draw the common pitch and the easing to the point B ; set up from the step to centre of rail at the newel post, equal the difference in height of post and short baluster, minus the rise of the common pitch from the riser to the point to bore for the baluster ; join B C, the pitch and length of tangents required for the mould.

To find the angles to form the wreath : Fit a piece to the tangents S N, S A and A D, Fig. 1 ; draw the pitch C B on the sides S N and S A ; cut to the marks ; apply the bevel to the sides A D and S N for the angles required.

To draw the mould, Fig. 3 : Square up from C to D and S, equal P S and P N, Fig 1 ; from the point D as a centre, with B J as a radius, describe arcs cutting the major axis in the points 2 and 3 ; place pins in the points, and by the use of thread or cord and pencil, describe the centre curve. From the points C and S as centres, with B R as radius, describe arcs cutting each other in H ; join S H, the tangent ; set off each way from D equal half the width of rail ; from the points describe the outside and inside curves. Cut the plank parallel to the centre curve 3-16 inch wider than the rail ; the joints at right angles to the tangent and face of plank.

Plate 12

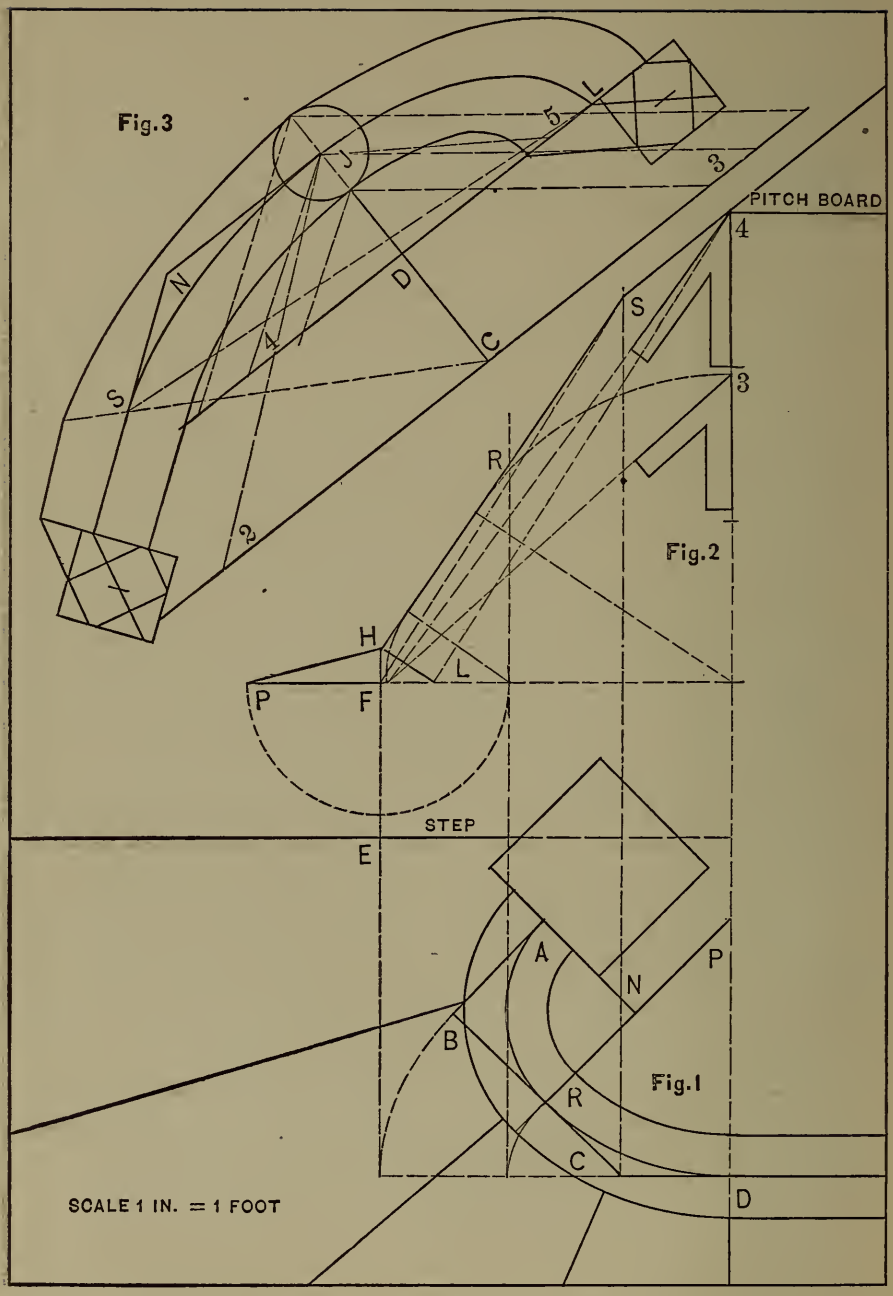

PLATE XII

Exhibits a plan of stairs with winders at the starting ; the curve described from centres of unequal radii ; the wreath in one piece.

To draw the elevation of the tangents A B, B C and C D, Fig. 1: Set up from step to pitch board equal four risers ; from the point draw the common pitch 4 S ; set up from E to F equal the difference in the heights of the newel and the short baluster, minus the rise of the common pitch from the riser to the point to bore for the baluster ; join S F ; parallel to S F draw 4 L ; square over from L to H ; join S H and H P. Then P H equals the elevation of A B, H S equals the elevation of B C, and S 4 equals the elevation of C D, Fig. 1.

To draw the mould, Fig. 3 : Square up from C to D and J equal P N R, Fig. 1 ; from the point J as a centre, with S H, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3, the points for pins ; and by the use of thread or cord and pencil, describe the curve from the point J ; set off from J to N equal R S, Fig. 2 ; from the point N as a centre, with S 4 as a radius, describe an arc cutting the curve in S ; join N S ; from the point S as a centre, with L 4, Fig. 2, as a radius, describe an arc cutting the major axis in L ; from the point J as a centre, with D L as a radius, describe arcs cutting the major axis in the points 4 and 5 for pins to describe the curve J L ; set off each way from J equal half the width of rail ; from the points describe the outside and inside curves.

To find the angles to bevel the plank for the vertical sides of the wreath : Fit a piece to the angles of the tangents, Fig. 1 ; draw the pitch 4 S on the side D C, and the pitch S H on the side C B ; cut to the marks ; apply the bevel to the sides A B and D C for the angles required.

Plate 13

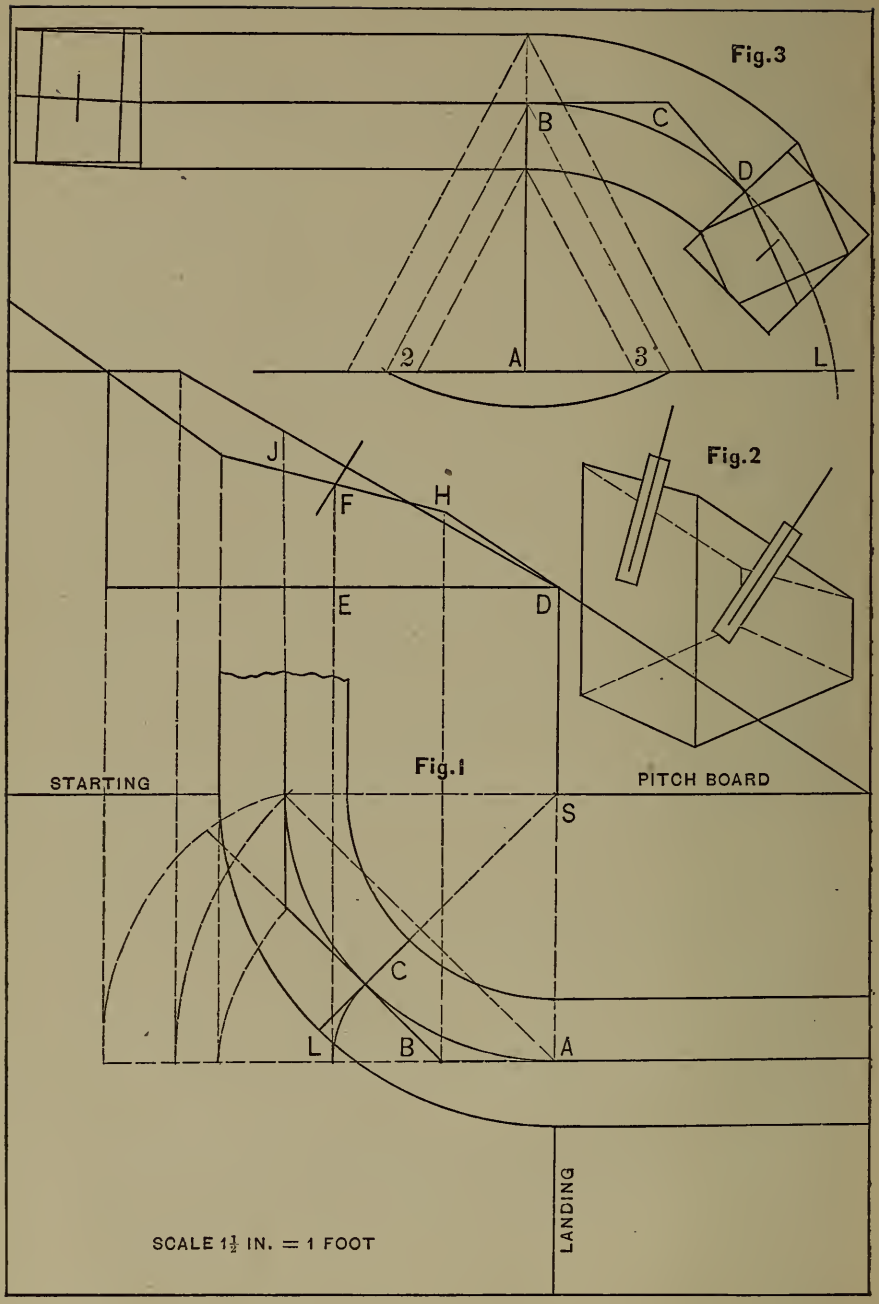
Fig.3
B
C
D
2
A
3
L
Fig.2
J
F
H
E
D
STARTING
Fig.1
PITCH BOARD
S
C
L
B
A
LANDING
SCALE 1½ IN. = 1 FOOT

PLATE XIII.

Fig. 1 *exhibits the plan and elevation of handrail for a quarter platform stairs.*

To draw the elevation : Square up from A B and L indefinitely ; set up from S to D equal the height of riser, and from E to F equal half the height of riser ; extend the pitch from D to H ; join H F.

To find the angles to form the wreath : Fit a piece to the tangents A B C, Fig. 1 ; draw the pitch D H on the side A B, and the pitch H F on the side B C ; cut to the marks, and apply the bevels as shown at Fig. 2.

To draw the mould, Fig. 3 : Square up from A to B equal S A, Fig. 1 ; set off from A to L, and from B to 2 and 3 equal D J, Fig. 1 ; place pins in the points 2 and 3 ; by the use of a thread or cord and pencil, describe the elliptical curve B L for the centre of the mould ; square over from A B to C equal D H ; draw the tangent C D equal H F, Fig. 1.

To find the width of the mould at B : Apply the bevel to the width of the rail ; place pins and draw the outside and inside curves. Cut the plank to a parallel width, three-sixteenths wider than the rail ; the joints at right angles to the tangents and face of plank.

Plate 14.

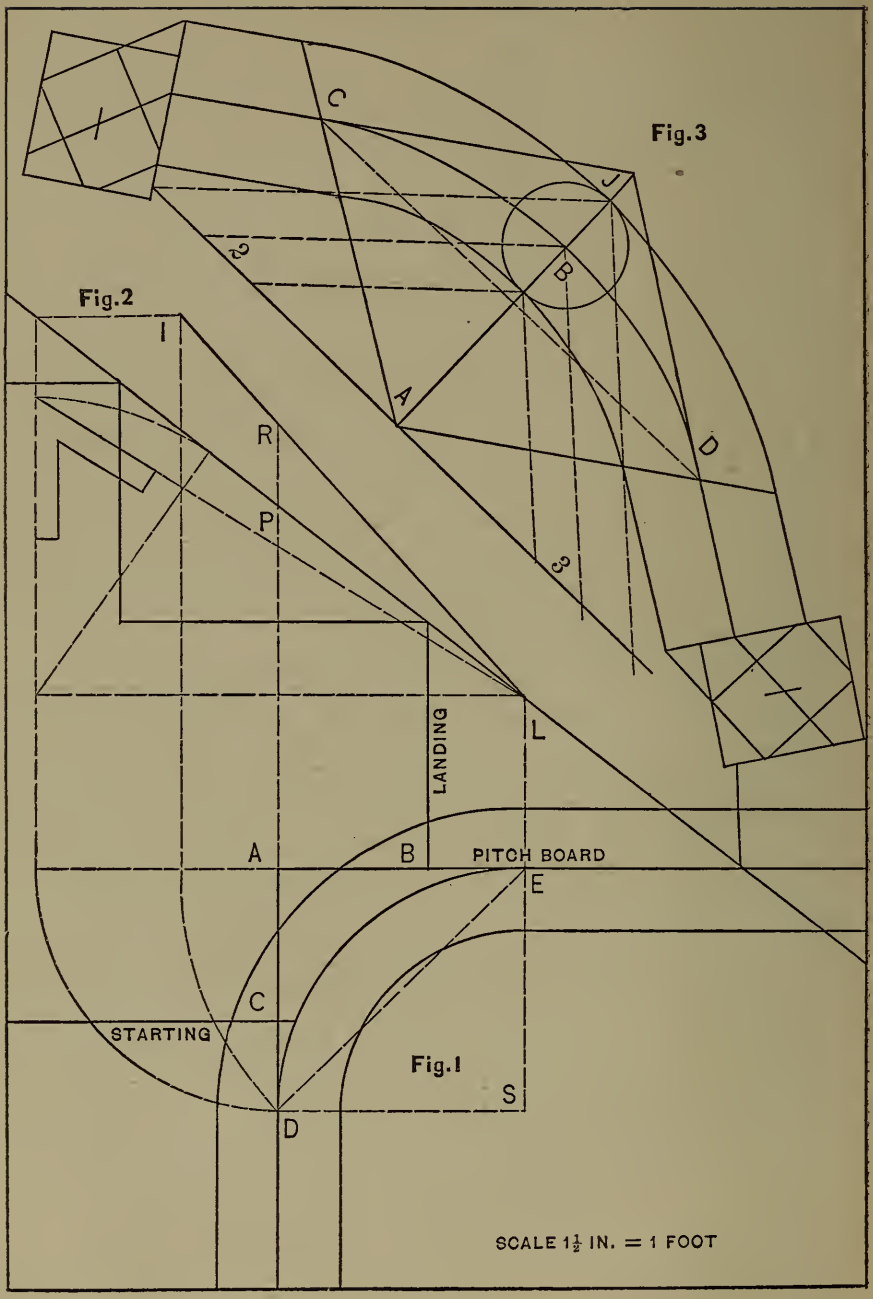
Fig.3
C
J
B
A
D
Fig.2
I
R
P
LANDING
L
A
B
PITCH BOARD
E
C
STARTING
Fig.1
S
D
SCALE 1½ IN. = 1 FOOT

PLATE XIV

Exhibits the plan for a quarter platform stairs.

To continue the common pitch in the wreath : Set off from the centre of rail A, to B and C equal half the width of step to face of risers.

To draw the mould, Fig. 3 : Square up from A to J equal E D, Fig. 1 ; from the points A and J as centres, with L P, Fig. 2, as a radius, describe arcs cutting each other in C and D ; then C D should equal L I, Fig. 2. Set up from A to B equal E S, Fig. 1 ; from the point B as a centre, with L R, Fig. 2, as a radius, describe arcs cutting the major axis in the points 2 and 3 ; place pins, and by the use of thread or cord and pencil, describe the centre curve. Set off each way from B equal half the width of rail ; from the points describe the outside and inside curves.

To find the vertical angle to bevel the plank for the wreath : Fit a piece to the angle of the tangents A D and A E, Fig. 1 ; draw the pitch L P on the sides ; cut to the marks ; apply the bevel for the angle required.

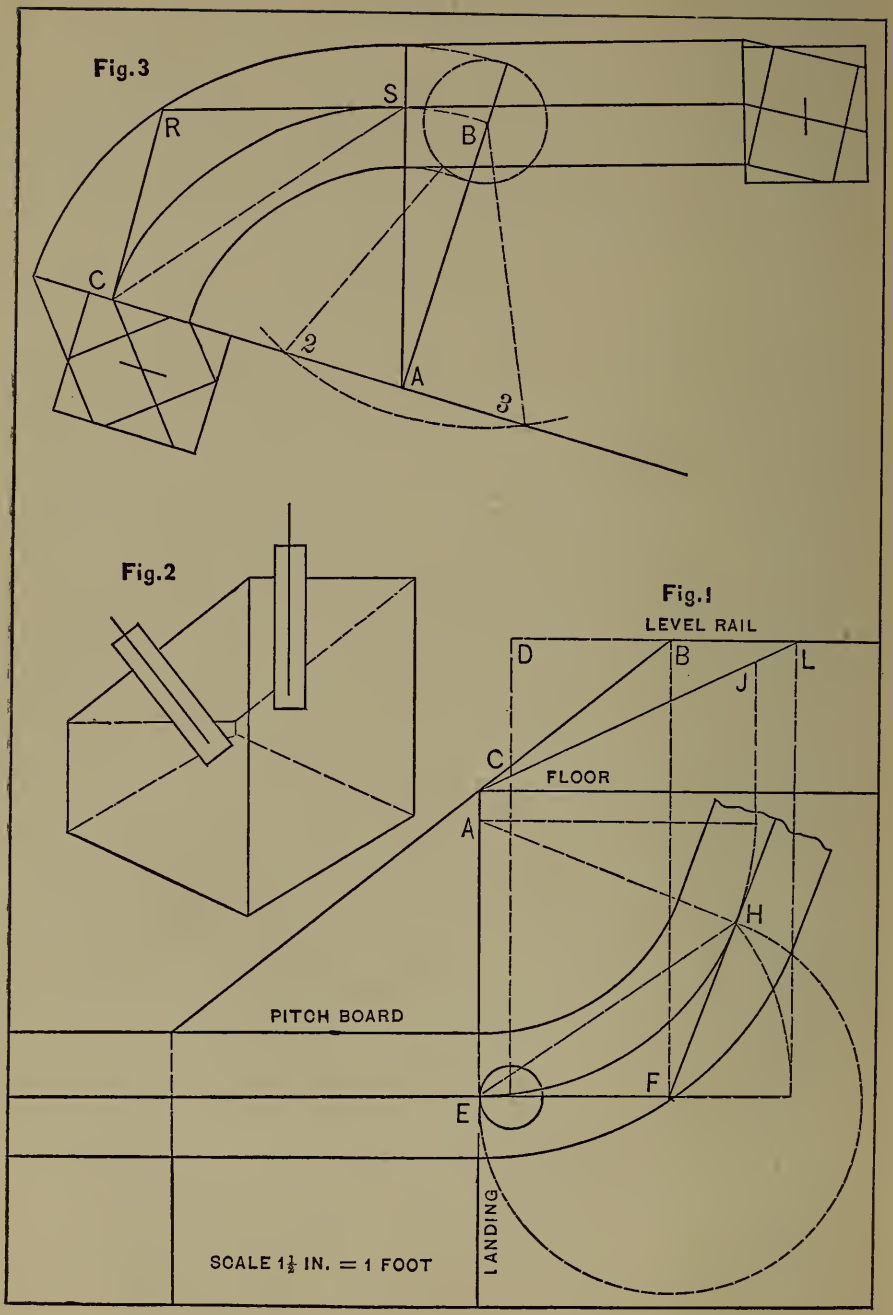
Fig.3
S
R
B
C
2
A
3
Fig.2
Fig.1
LEVEL RAIL
D
B
J
L
C
FLOOR
A
H
PITCH BOARD
F
E
LANDING
SCALE 1½ IN. = 1 FOOT

PLATE XV.

Fig. 1 *exhibits the plan for an obtuse-angled staircase*, at the landing.

To find the length of curve required for the easing : Draw the common pitch A B ; set up from C to D equal half the riser ; from the point D, draw the centre of level rail ; draw B F parallel to A E, and F H equal F E, the angle required; join H A equal the radius, and H E equal the length of curve.

To find the vertical angles to form the wreath : Fit a piece to the tangents E F H ; draw the pitch B C on the side F E ; square over on the side F H ; cut to the marks ; apply the bevel as shown at Fig. 2.

To draw the mould, Fig. 3 : Square up from A to B equal A H, Fig. 1 ; set off from A to C, and from B to 2 and 3 equal A J, Fig. 1 ; place pins in the points 2 and 3 ; by the use of thread or cord and pencil, describe the centre curve.

To find the length of curve : From the point C as a centre, with A L, Fig. 1, as a radius, describe an arc cutting the curve in S.

To find the direction of straight rail : From the points C and S as centres, with H F and A B, Fig. 1, as radii, describe arcs cutting each other in the point R ; join C R and R S, the direction required ; set off each way from B half the width of rail. The bevel applied to the width of rail equals the width of mould at the joint C.

Plate 16

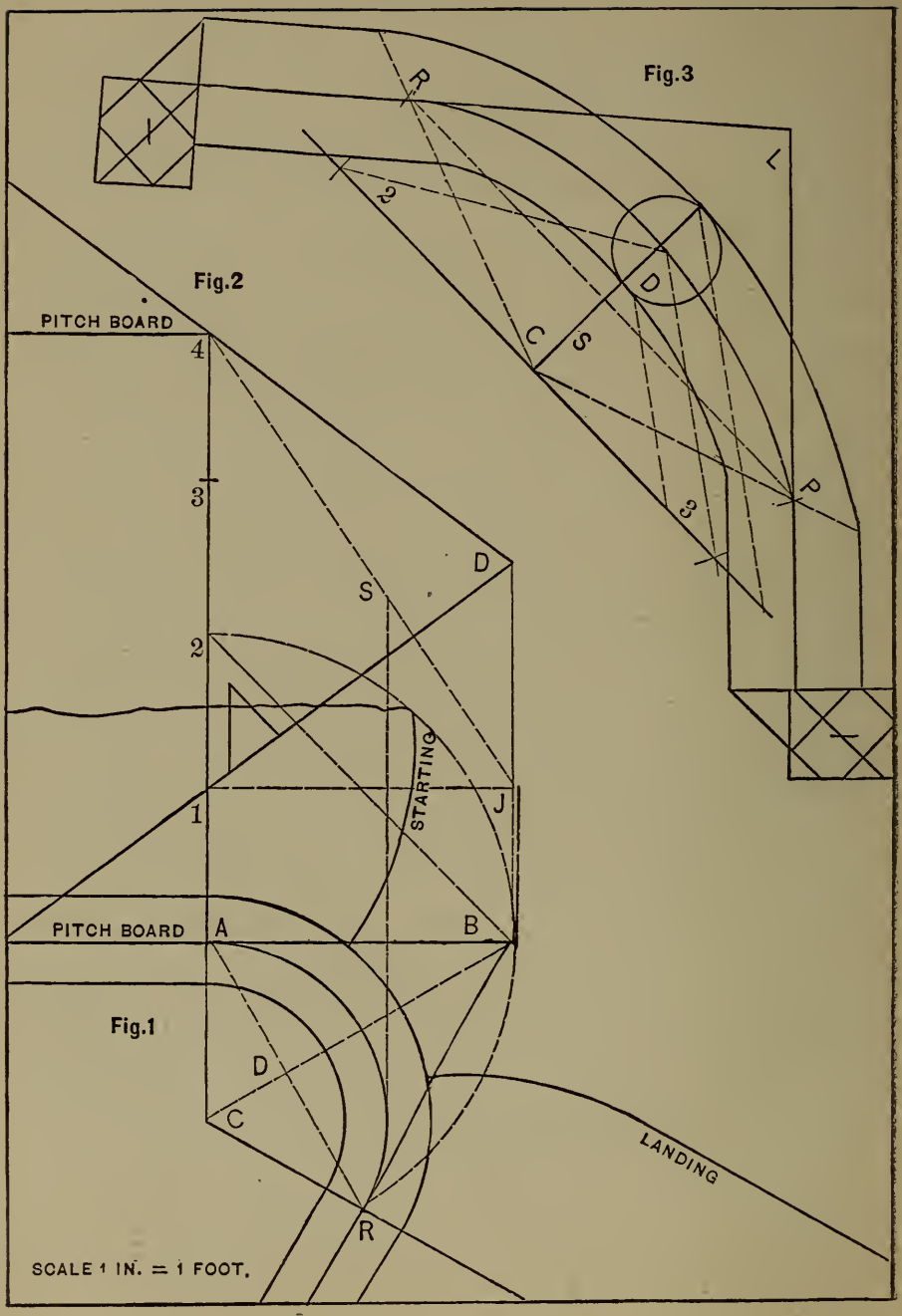
Fig.3
R
L
1
2
D
C
S
P
3
Fig.2
PITCH BOARD
4
3
2
1
D
S
STARTING
J
PITCH BOARD
A
B
Fig.1
D
C
R
LANDING
SCALE 1 IN. = 1 FOOT.

PLATE XVI.

Fig. 1 *exhibits the plan for an acute-angled platform stairs.*

To continue the common pitch in the tangents : Set off from A to B equal one and one-half step ; square up from A to 4 equal four risers ; from the points 1 and 4 draw the common pitch to the point D.

To find the angles to bevel the plank for the wreath : Fit a piece to the angle of the tangents A B R, Fig. 1 ; draw the pitch I D on the side R B, and the pitch D 4 on the side B A ; cut to the marks ; apply the bevel to the sides for the angle required.

To draw the mould, Fig. 3 : Square up from C indefinitely ; set up from C to S equal C D, Fig. 1, and from S to R and P equal J 4, Fig. 2, bisected ; from the points R and P as centres, with D 4, Fig. 2, as radius, describe arcs cutting each other in L ; draw L P and L R the direction of straight rail ; set up from C to D equal C A, Fig. 1 ; from the point D as a centre, with S 4, Fig. 2, as a radius, describe arcs cutting the major axis in the points 2 and 3 for pins, and by the use of thread or cord and pencil, describe the centre curve ; set off each way from D equal half the width of rail ; from the points describe the outside and inside curves.

Plate 17

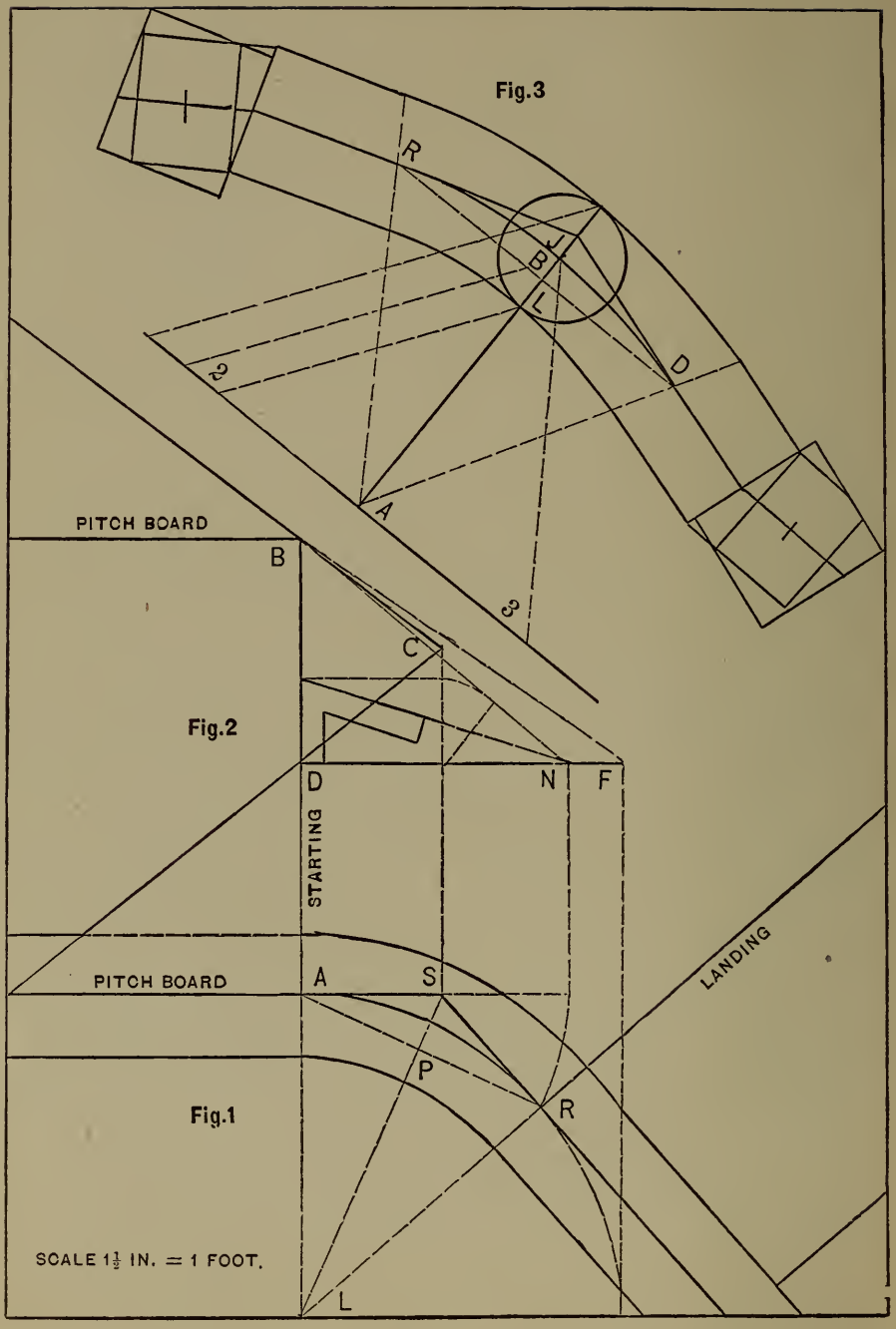
Fig.3
R
B
J
L
D
2
A
1
PITCH BOARD
B
3
C
Fig.2
D
N
F
STARTING
PITCH BOARD
A
S
LANDING
P
R
Fig.1
SCALE 1½ IN. = 1 FOOT.
L

PLATE XVII.

Fig. 1 *exhibits the plan of an obtuse-angled platform stairs.*

To draw the elevation of the handrail : Set up from A to B equal two (2) risers ; draw the common pitch D C and B C ; from the point of intersection, draw C S parallel to B A, and S R equal S A.

To find the angle to bevel the plank for the wreath : Fit a piece to the tangents A S R, Fig. 1 ; draw the pitch C D on the side S R, and the pitch C B on the side S A ; cut to marks ; apply the bevel for the angle required.

To draw the mould for the wreath, Fig. 3 : Square up from A to L and J, equal L P S, Fig. 1 ; set off from L to R and D equal N B, Fig. 2, bisected ; draw J R and J D the direction of straight rail ; set up from A to B equal L A, Fig. 1 ; from the point B as a centre, with F B, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3 ; place pins in the points ; by the use of thread or cord and pencil, describe the centre curve ; set off each way from B equal half the width of rail ; from the points describe the outside and inside curves.

Plate 18

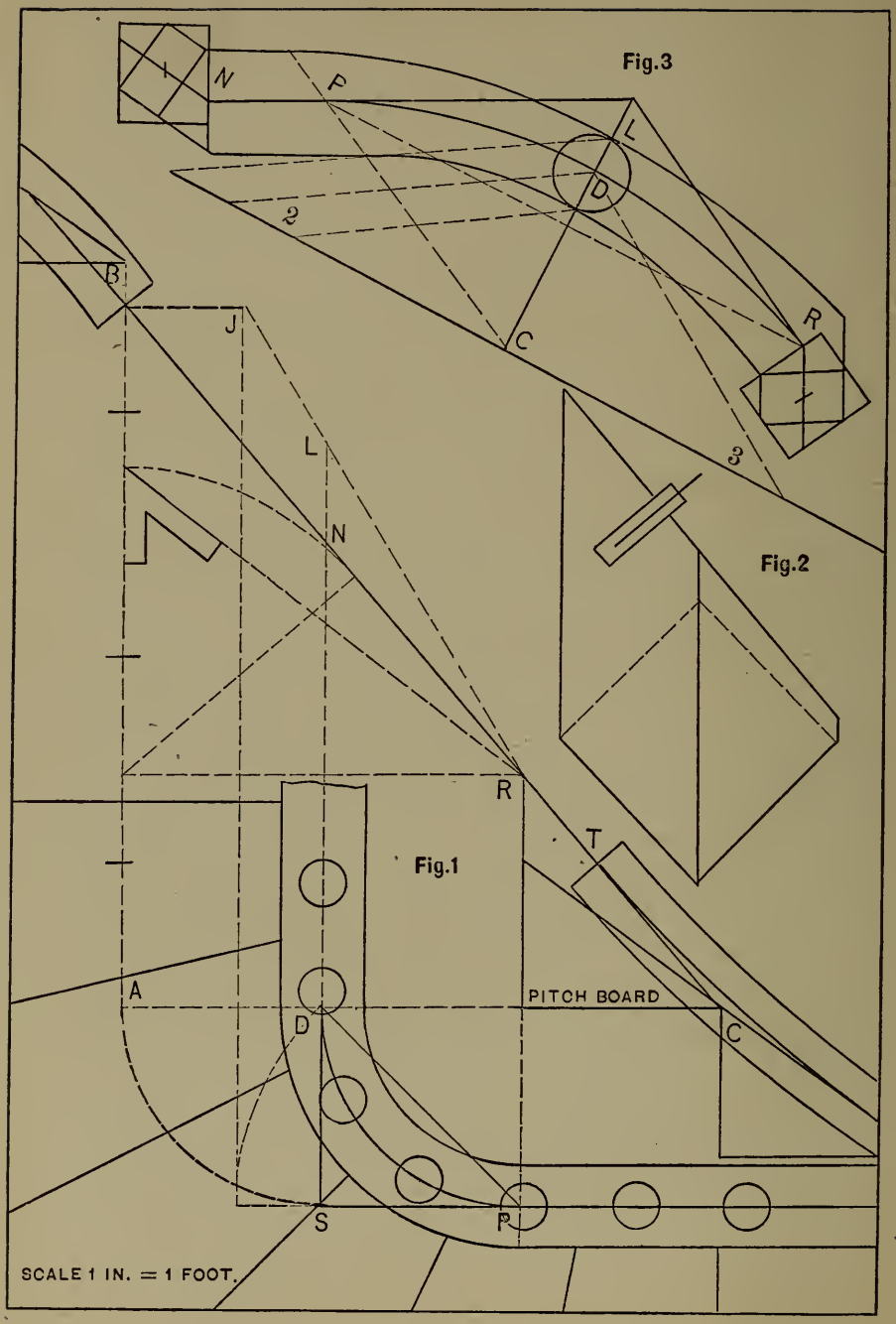
Fig.3
N
P
L
D
2
B
J
C
R
1
3
L
N
Fig.2
R
T
Fig.1
A
PITCH BOARD
D
C
S
P
SCALE 1 IN. = 1 FOOT.

PLATE XVIII

Exhibits a quarter circle of winding stairs.

To draw the elevation of the handrail : Set up from A to B equal five risers ; from the points B and C, draw the common pitch ; from the pitch as tangents, describe the easings ; join C B tangent to the easings.

To find the angle to bevel the plank in the joints : Fit a piece to the tangents D S P ; draw the pitch R N on the sides ; cut to the marks ; apply the bevel as shown in Fig. 2.

To draw the mould, Fig. 3 : Square up from C to D and L, equal D S and D P, Fig. 1 ; from the points C and L as centres, with R B bisected as a radius, describe arcs cutting each other in P and R ; then P R should equal R J ; join L R and L P ; extend L P to N equal R T, Fig. 1 ; from the point D as a centre, with R L, Fig. 1, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, and by the use of thread or cord and pencil, describe the curve P D R ; set off each way from D equal half the width of rail ; from the points describe the outside and inside curves.

Plate 19

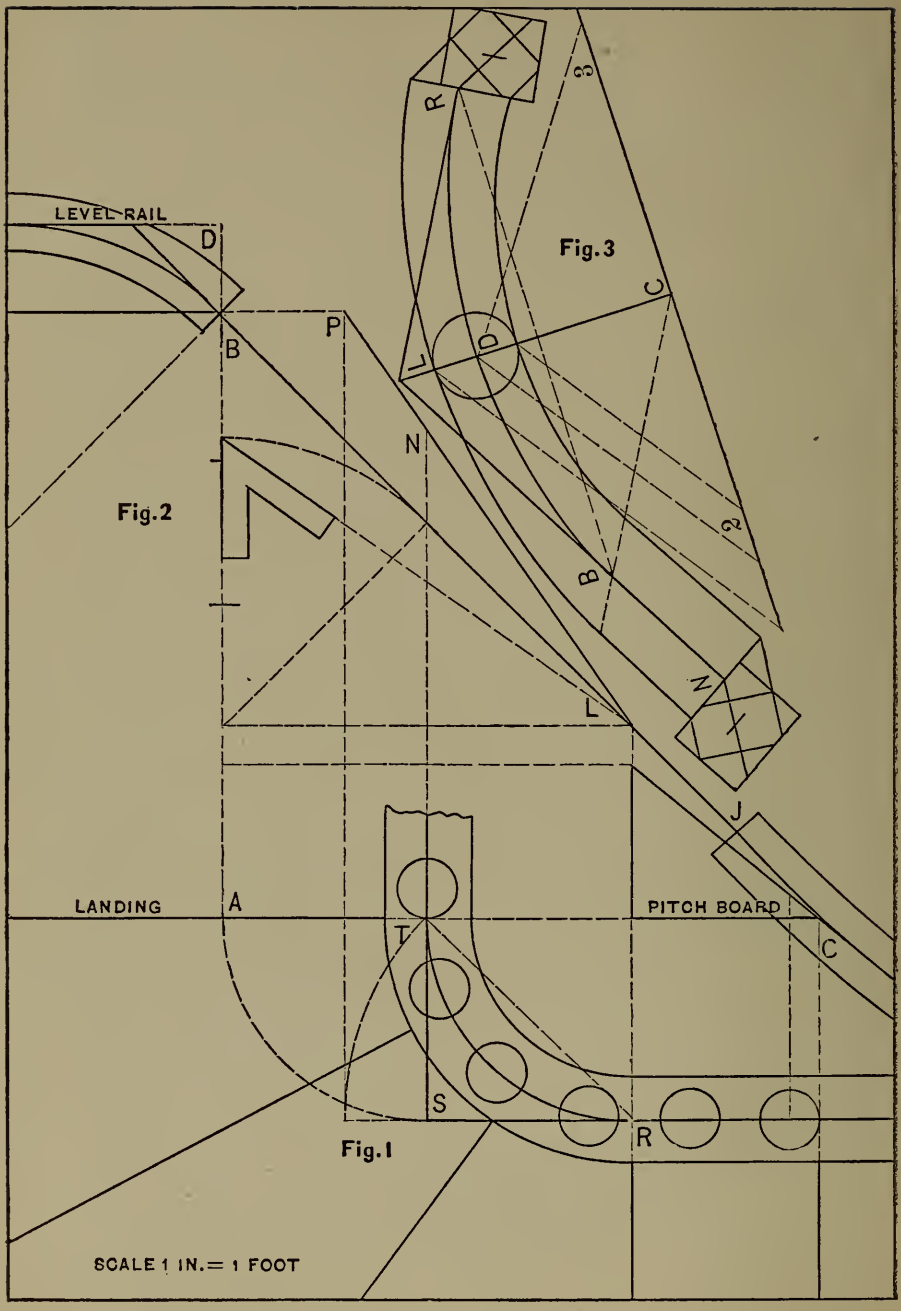
LEVEL RAIL
D
B
P
N
L
A
LANDING
PITCH BOARD
C
J
T
S
R
Fig.1
Fig.2
Fig.3
SCALE 1 IN. = 1 FOOT

PLATE XIX

Exhibits a quarter circle of winders at the landing.

To draw the elevation of rail : Set up from A to B equal four risers ; from the point C draw the common pitch and easing ; tangent to the easing draw C B ; set up from B to D equal half the riser, plus the rise of common pitch from the riser to the point to bore for baluster, as shown on the pitch-board.

To draw the mould, Fig. 3 : Square up from C to D and L equal T S and T R, Fig. 1 ; draw L R and L B, equal L B, Fig. 2, bisected, and B R equal L P, Fig. 2 ; extend L B to N equal L J, Fig. 2 ; from the point D as a centre, with L N, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, by the use of thread or cord and pencil, describe the curve B D R ; set off each way from D equal half the width of rail ; from the points describe the outside and inside curves.

Plate 20

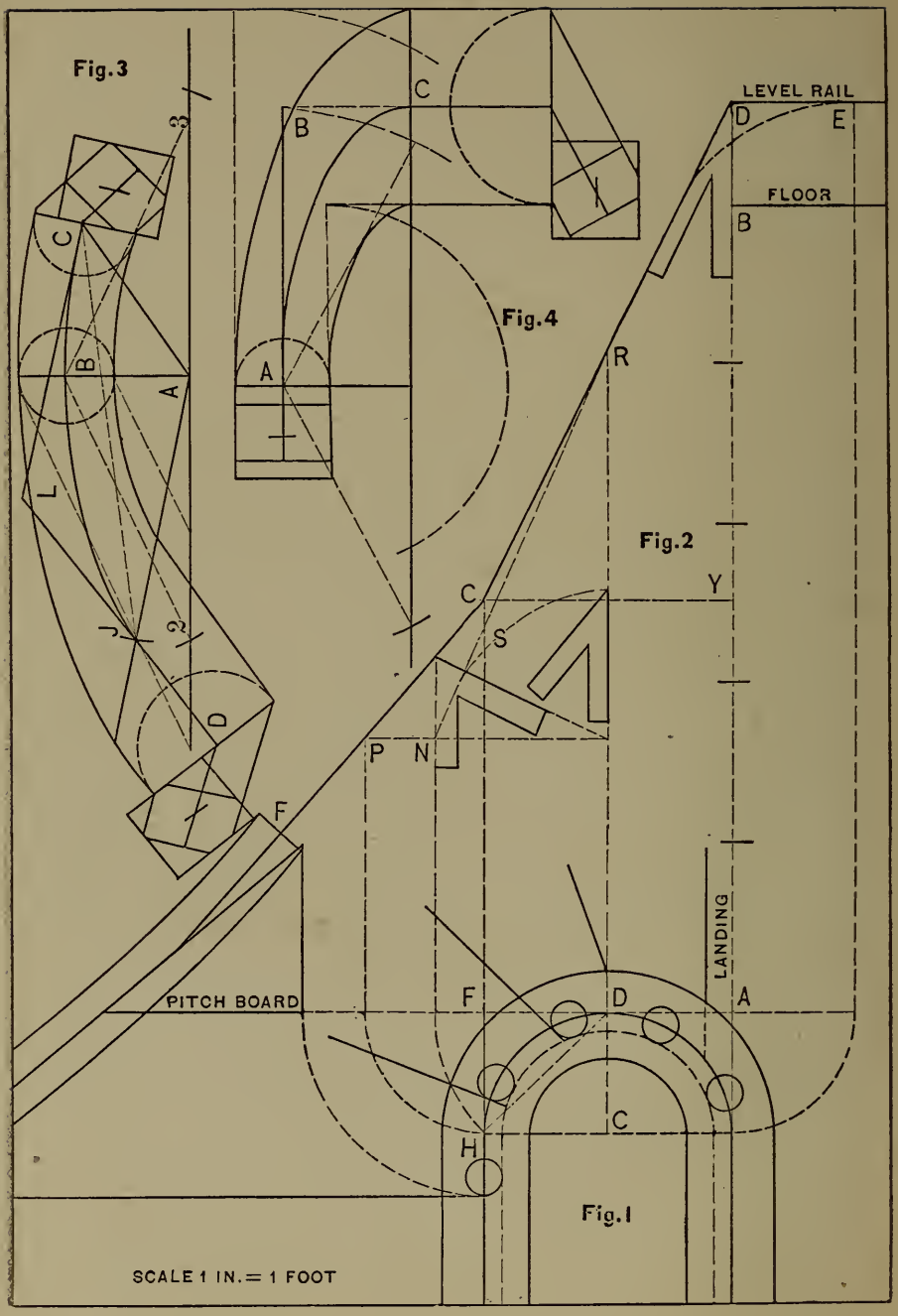
Fig.3
Fig.4
Fig.2
Fig.1
LEVEL RAIL
FLOOR
PITCH BOARD
LANDING
SCALE 1 IN. = 1 FOOT

PLATE XX

Exhibits a plan of stairs with winders at the landing.

To draw the elevation of the rail : Set up from A to B equal five risers, and from B to D equal half the riser, plus the rise of the common pitch from the riser to the point to bore for baluster ; bisect A B in Y ; square over to C ; join C D ; place the pitch-board ; draw the common pitch, also the easing ; tangent to the easing, draw F C.

To draw the mould, Fig. 3 : Square up from A to B equal C D, Fig. 1 ; from the point B as a centre, with R S, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, by the use of thread or cord, describe the centre curve ; from the point A as a centre, with P C, Fig. 2, as a radius, describe an arc cutting the curve in C ; from the point C as a centre, with R N, Fig. 2, as a radius, describe an arc cutting the curve in J ; from the points C and J as centres, with P C and R C, Fig. 2, as radii, describe arcs cutting each other in L ; draw C L and L J extended to D, equal P F, Fig. 2 ; set off each way from B equal half the width of rail ; from the points draw the outside and inside curves.

To find the angles to bevel the plank for the wreath ; Fit a piece to the angle of the tangents H F D, Fig. 1 ; draw the pitch P C on the side H F, the pitch C R on the side F D ; cut to the marks ; apply the bevel to the sides for the angles required.

To draw the mould for the upper wreath, Fig. 4 ; Draw A B equal R D, Fig. 2, and B C equal C D, Fig. 1 ; set off each way from A equal half the width of rail ; from the points describe the curves required.

Plate 21

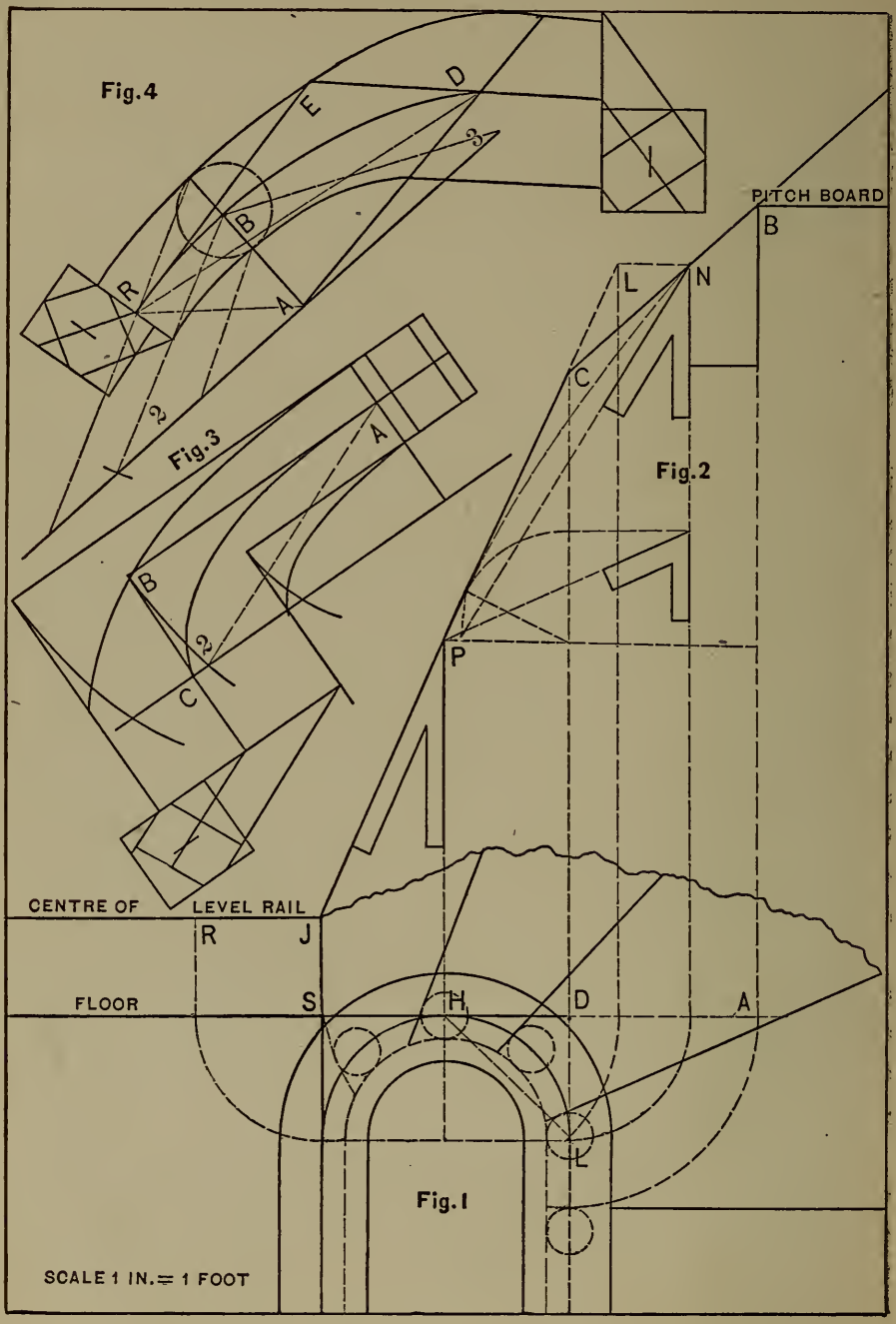
Fig.4
D
E
3
B
R
A
2
Fig.3
A
B
2
C
PITCH BOARD
B
L
N
C
Fig.2
P
CENTRE OF
LEVEL RAIL
R
J
FLOOR
S
H
D
A
L
Fig.1
SCALE 1 IN. = 1 FOOT

PLATE XXI

Exhibits a continuation of of stairs with winders at the landing, to the starting of second flight.

To draw the elevation of handrail : Square up from A to B equal five risers ; from the point B, draw the common pitch B C ; set up from S to J equal half the riser and the rise of the common pitch from the riser to the point to bore for the baluster ; join C J.

To draw the mould for the lower wreath, Fig. 3 : Draw A B and B C equal R J and J P, Fig. 2 ; from the point A as a centre, describe the arc B 2 cutting the major axis in the point for pins to describe the centre curve ; set off each way from A equal half the width of rail ; from the points describe the outside and inside curves.

To draw the mould for the upper wreath, Fig. 4 : Square up from A to B equal H D, Fig. 1 ; from the point B as a centre, with P C, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, by the use of thread or cord and pencil, describe the centre curve ; from the point A as a centre, with C N, Fig. 2, as a radius, describe an arc cutting the curve in R ; from the point R as a centre, with P L, Fig. 2, as a radius, describe an arc cutting the curve in D ; draw R E equal P C, and D E equal N C, Fig. 2 ; set off each way from B equal half the width of rail ; from the points describe the outside and inside curves.

To find the angles to bevel the plank for the wreath : Fit a piece to the angle of the tangents H D L, Fig. 1 ; draw the pitch P C on the side H D, and the pitch C N on the side D L ; cut to the marks ; apply the bevel to the sides for the angles required.

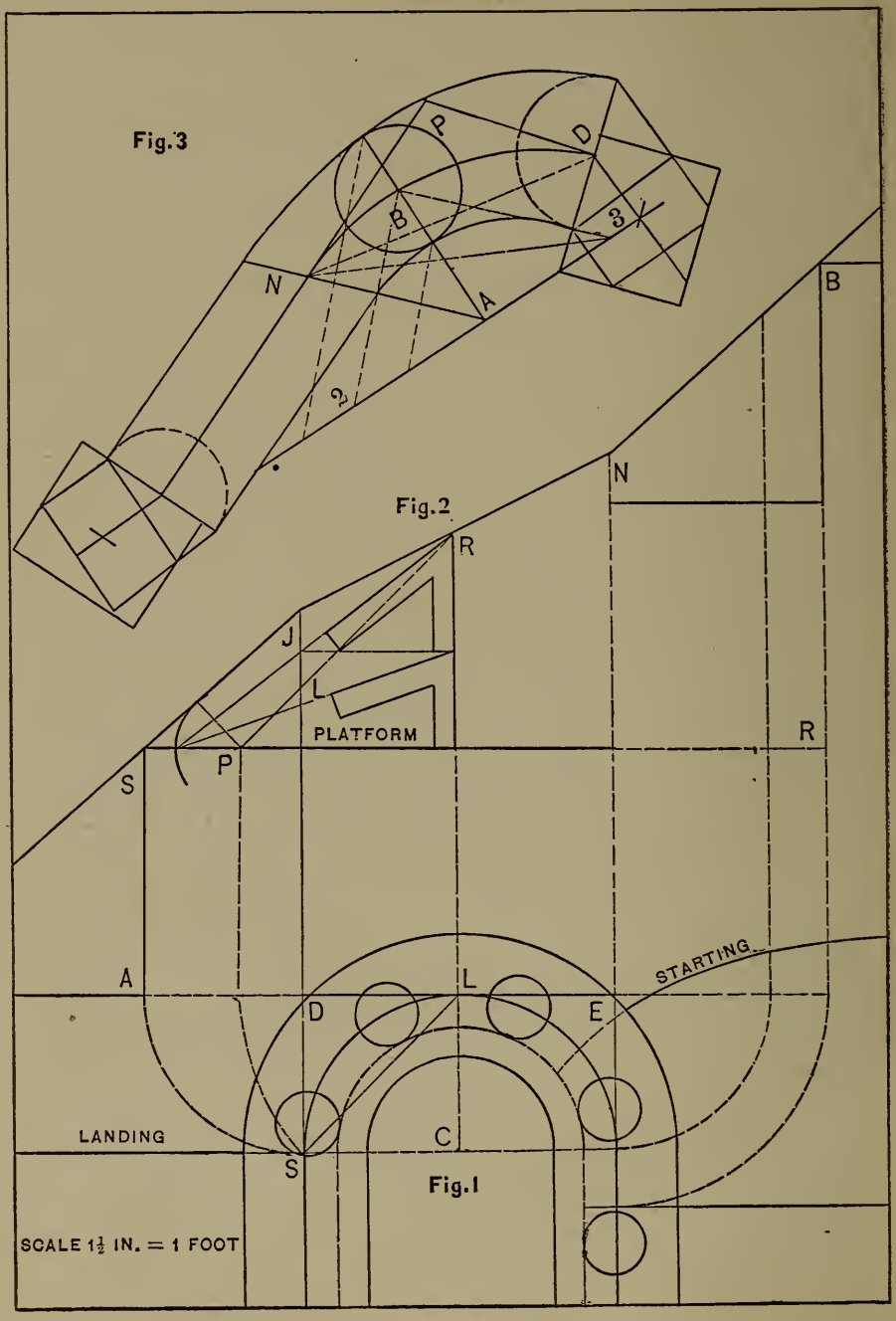
Fig.3
P
D
B
3
N
A
2
1
Fig.2
B
N
R
J
L
PLATFORM
R
S
P
A
L
STARTING
D
E
LANDING
C
S
Fig.1
SCALE 1½ IN. = 1 FOOT

PLATE XXII

Exhibits a plan for platform stairs. For want of room at the landing of return flight, the step at the starting is placed in the cylinder.

To draw the elevation of the handrail: Set up from A to S equal one riser, and from R to B equal two risers ; from the points draw the common pitch to intersect the lines squared up from D and E.

To draw the mould, Fig. 3 : Square up from A to B equal C S, Fig. 1 ; from the point B as a centre, with R L, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, by the use of thread or cord and pencil, describe the centre curve ; from the point A as a centre, with R J, Fig. 2, as a radius, describe an arc cutting the curve in N ; from the point N as a centre, with R P, Fig. 2, as a radius, describe an arc cutting the curve in D ; from the points D and N as centres, with R J and S J as radii, describe arcs cutting each other in P ; set off each way from B equal half the width of rail ; from the points describe the outside and inside curves.

To find the angles to bevel the plank for the wreath : Fit a piece to the angle of the tangents S D L, Fig. 1 ; draw the pitch S J on the side S D, the pitch J R on the side D L ; cut to the marks ; apply the bevel to the sides for the angles required.

Plate 23

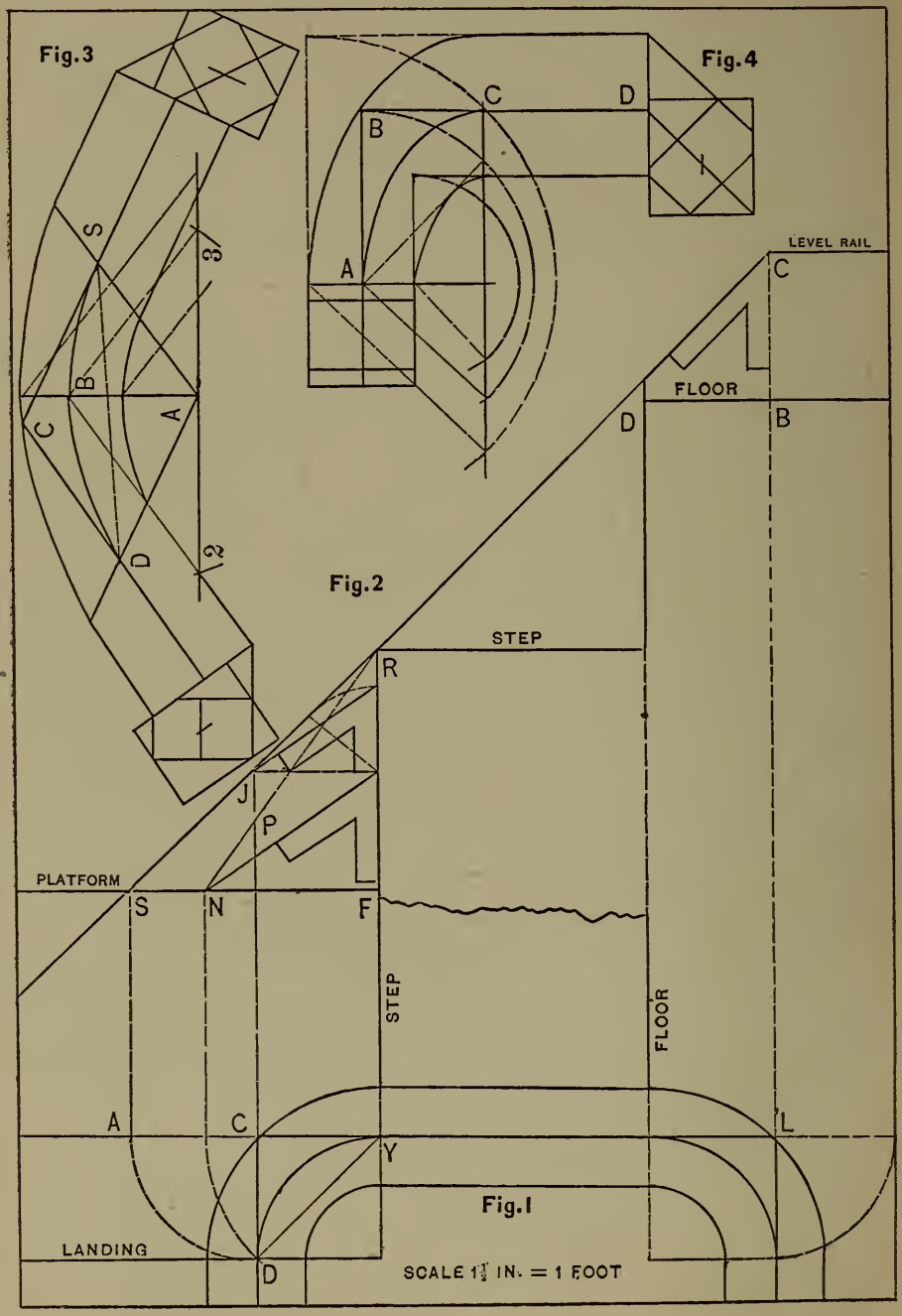
Fig.3
Fig.4
S
3
2
B
A
C
D
C
D
B
A
LEVEL RAIL
FLOOR
D
B
Fig.2
STEP
R
J
P
PLATFORM
S
N
F
STEP
FLOOR
A
C
L
Y
Fig.1
LANDING
D
SCALE 1½ IN. = 1 FOOT

PLATE XXIII

Exhibits a quarter platform stairs, placed one step below second floor.

To draw the elevation of handrail : Set up from A to S equal one riser, from L to B equal three risers, and from B to C equal half the riser, plus the rise of the common pitch from the riser to the point to bore for the baluster ; draw S J the common pitch ; join J C.

To draw the mould, Fig. 3 : Square up from A to B equal C Y, Fig. 1 ; from the point B as a centre, with R P, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, by the use of thread or cord and pencil, describe the centre curve ; from the point A as a centre, with S J, Fig. 2, as a radius, describe an arc cutting the curve in S ; from the point S as a centre, with R N, Fig. 2, as a radius, describe an arc cutting the curve in D ; from the points D and S as centres, with S J and R J as radii, describe arcs cutting each other in C ; set off each way from B equal half the width of rail ; from the points describe the outside and inside curves.

To draw the mould, Fig. 4 : Set off from B to A and from B to C equal C D and D B, Fig. 2 ; the dotted curves from B cuts the major axis in the points for pins to describe the centre curve.

To find the angles to bevel the plank for the wreath, Fig. 3 : Fit a piece to the angle of the tangents D C Y, Fig. 1 ; draw the pitch S J on the side D C, the pitch J R on the side C Y ; cut to the marks ; apply the bevel to the sides for the angles required.

Plate 24

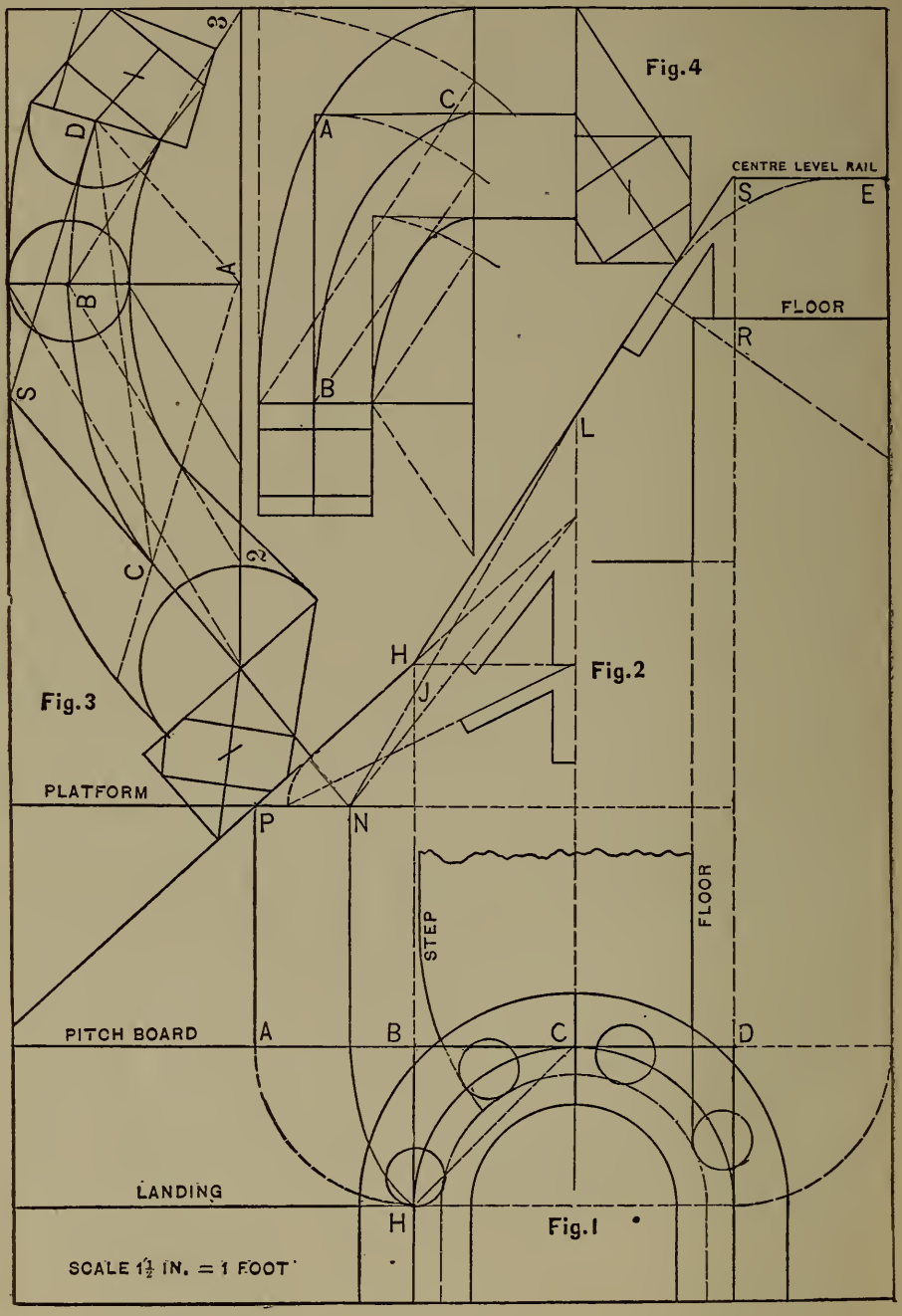
Fig.4
CENTRE LEVEL RAIL
FLOOR
Fig.2
Fig.3
PLATFORM
STEP
FLOOR
PITCH BOARD
LANDING
Fig.1
SCALE 1½ IN. = 1 FOOT

PLATE XXIV

Exhibits a plan of handrail for quarter platform stairs at the landing.

To draw the elevation : Set up from A to P equal one riser, from D to R equal three risers, and from R to S equal half the riser, plus the rise of the common pitch from the riser to the point to bore for the baluster.

To draw the mould, Fig. 3 : Square up from A to B equal C B, Fig. 1 ; from the point B as a centre, with L J, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, by the use of thread or cord and pencil, describe the centre curve ; from the point A as a centre, with P H, Fig. 2, as a radius, describe an arc cutting the curve in D ; from the point D as a centre, with L N, Fig. 2, as a radius, describe an arc cutting the curve in C ; from the points C and D as centres, with P H and L H as radii, describe arcs cutting each other in S ; set off each way from B equal half the width of rail ; from the points describe the outside and inside curves.

To draw the mould, Fig. 4 : Set off from A to B and C equal L S and E S, Fig. 2 ; from the point B as a centre, describe an arc from A cutting the major axis in the points for pins to describe the centre curve.

To find the angles to bevel the plank for the wreath, Fig. 3 : Fit a piece to the angle of the tangents H B C, Fig. 1 ; draw the pitch P H on the side H B, and the pitch H L on the side B C ; cut to the marks ; apply the bevel to the sides for the angles required.

Plate 25

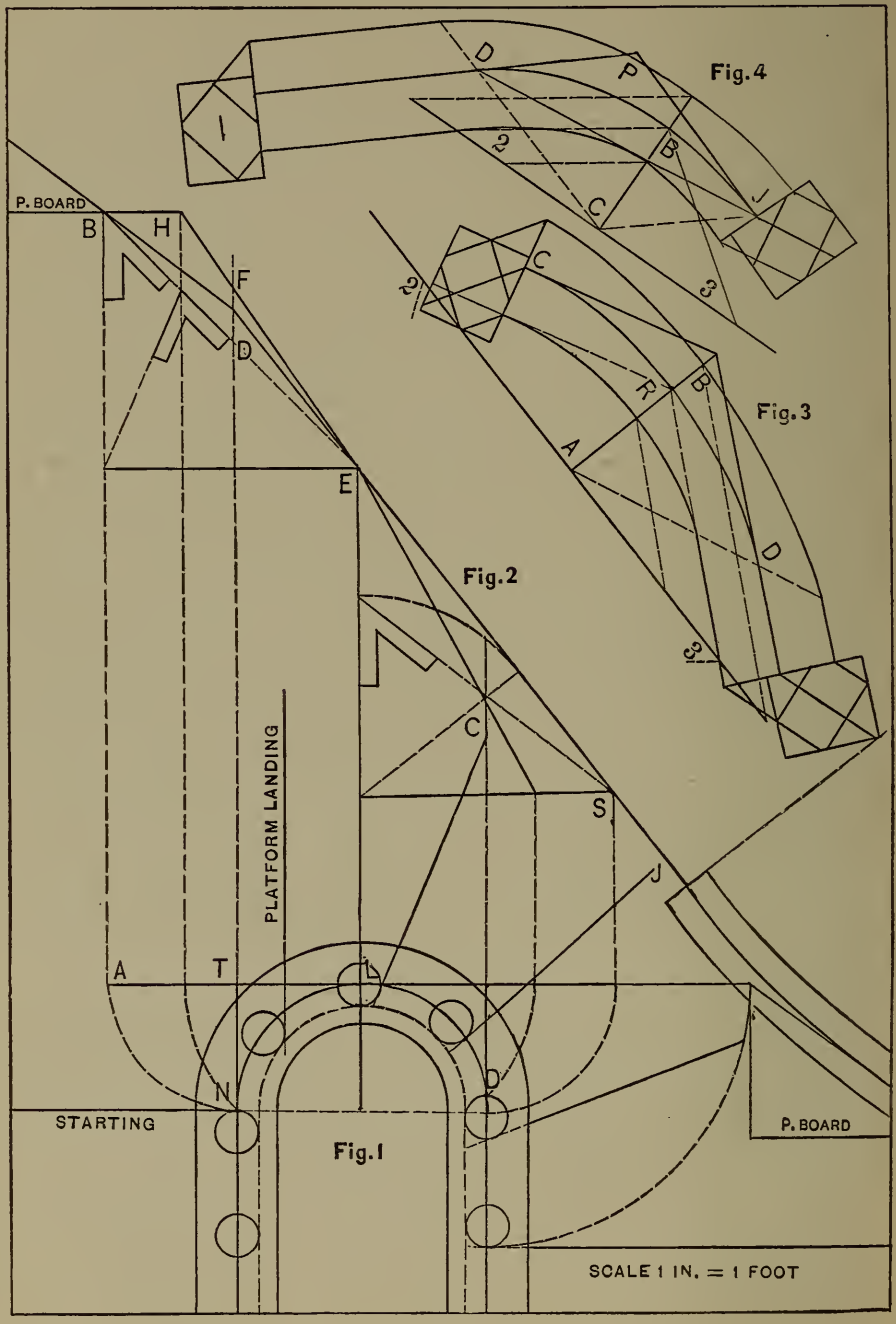
Fig. 4
D
P
1
2
B
C
J
P. BOARD
B
H
F
D
Fig. 3
C
2
3
R
B
A
D
3
E
Fig. 2
C
S
PLATFORM LANDING
J
A
T
L
N
D
STARTING
Fig. 1
P. BOARD
SCALE 1 IN. = 1 FOOT

PLATE XXV

Exhibits the plan for a quarter circle of winders and platform.

To draw the elevation of the handrail : From the point J draw the common pitch and easing ; set up from A to B equal five risers ; from the point B draw B D, the common pitch, and D J tangent to the easing.

To draw the mould, Fig. 3 : Square up from A to R and B equal L T and L N, Fig. 1 ; from the points A and B as centres, with S E, Fig. 2, bisected, describe arcs cutting each other in C and D ; from the point R as a centre, with E C, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, by the use of thread or cord and pencil, describe the centre curve ; set off each way from R equal half the width of rail ; from the points describe the outside and inside curves ; extend B D equal S J, Fig. 2.

To draw the mould, Fig. 4 : Square up from C to B equal L T, Fig. 1 ; from the point B as a centre, with E F, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, by the use of thread or cord and pencil, describe the centre curve ; draw C J equal B D, and J D equal E H, Fig. 2 ; from the points J and D as centres, with E D and B D, Fig. 2, as radii, describe arcs cutting each other in P ; set off each way from B equal half the width of rail ; from the points describe the outside and inside curves.

To find the angles to bevel the plank : Fit a piece to the angle of the tangents N T L, Fig. 1 ; draw the pitch E D on the side L T, and the pitch D B on the side T N ; cut to the marks ; apply the bevel to the sides for the angles required.

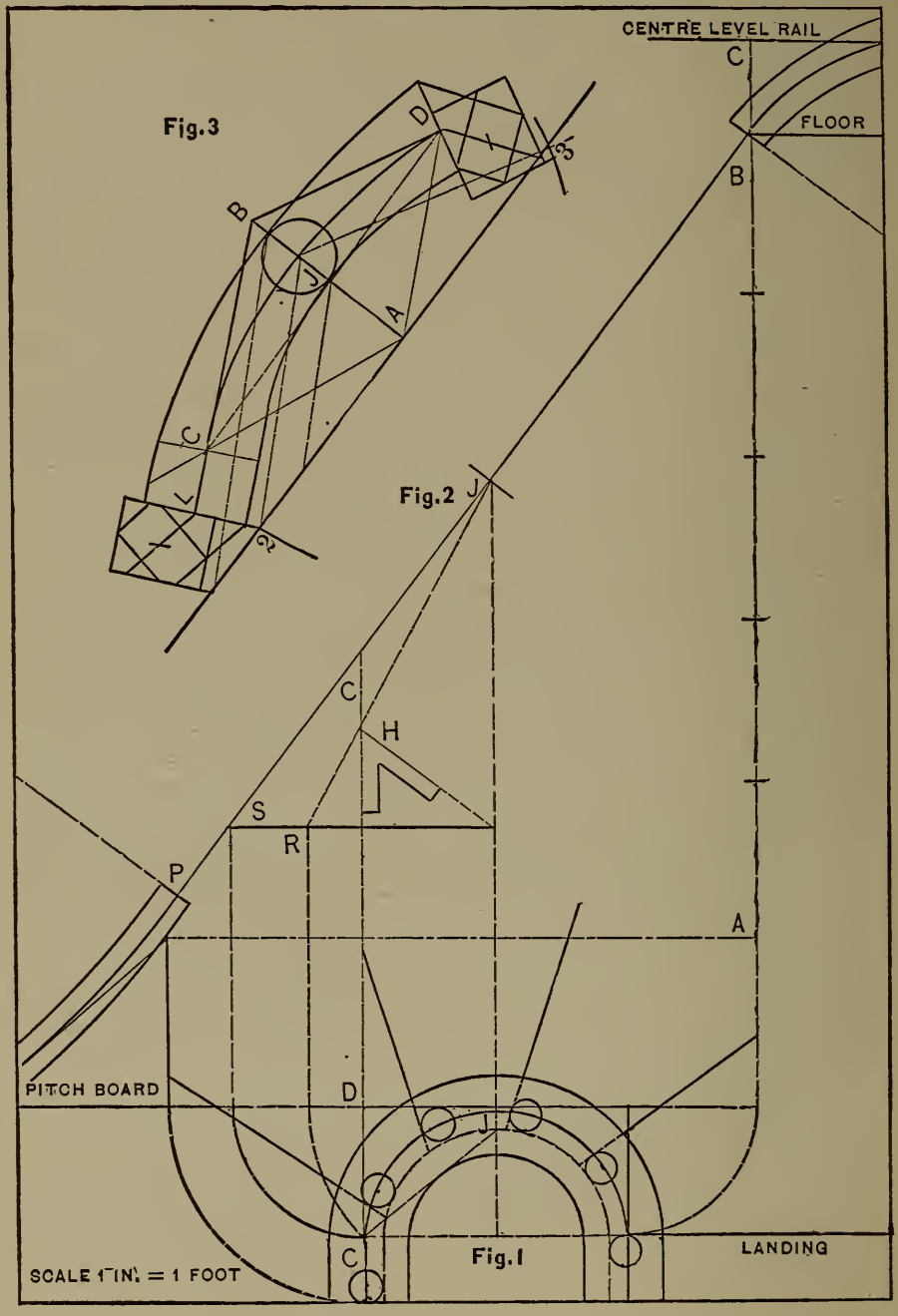
CENTRE LEVEL RAIL
C
FLOOR
B
Fig.3
D
B
J
A
C
L
1
2
3
Fig.2
J
C
H
S
R
P
A
PITCH BOARD
D
J
C
Fig.1
LANDING
SCALE 1 IN. = 1 FOOT

PLATE XXVI

Exhibits a plan of winding stairs at the landing.

To draw the elevation of the rail: Draw the common pitch and easing; set up from A to B equal five risers; draw B P tangent to the easing; set up from B to C equal half the riser, plus the rise of the common pitch from the riser to the point to bore for the baluster.

To draw the mould, Fig. 3: Square up from A to J and B equal C D and C J, Fig. 1; draw B C and B D equal S J, Fig. 2, bisected, and C D equal J R, Fig. 2; from the point J as a centre, with J H, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3; with pins in the points, by the use of thread or cord and pencil, describe the centre curve; set off each way from J equal half the width of rail; from the points describe the outside and inside curves extend B C to L equal S P, Fig. 2; then L D equals the length of lower wreath, and C D the length of upper wreath.

To find the angle to bevel the plank: Fit a piece to the angle of the tangents C D J, Fig. 1; draw the pitch S C on the sides; cut to the marks, and apply the bevel for angle.

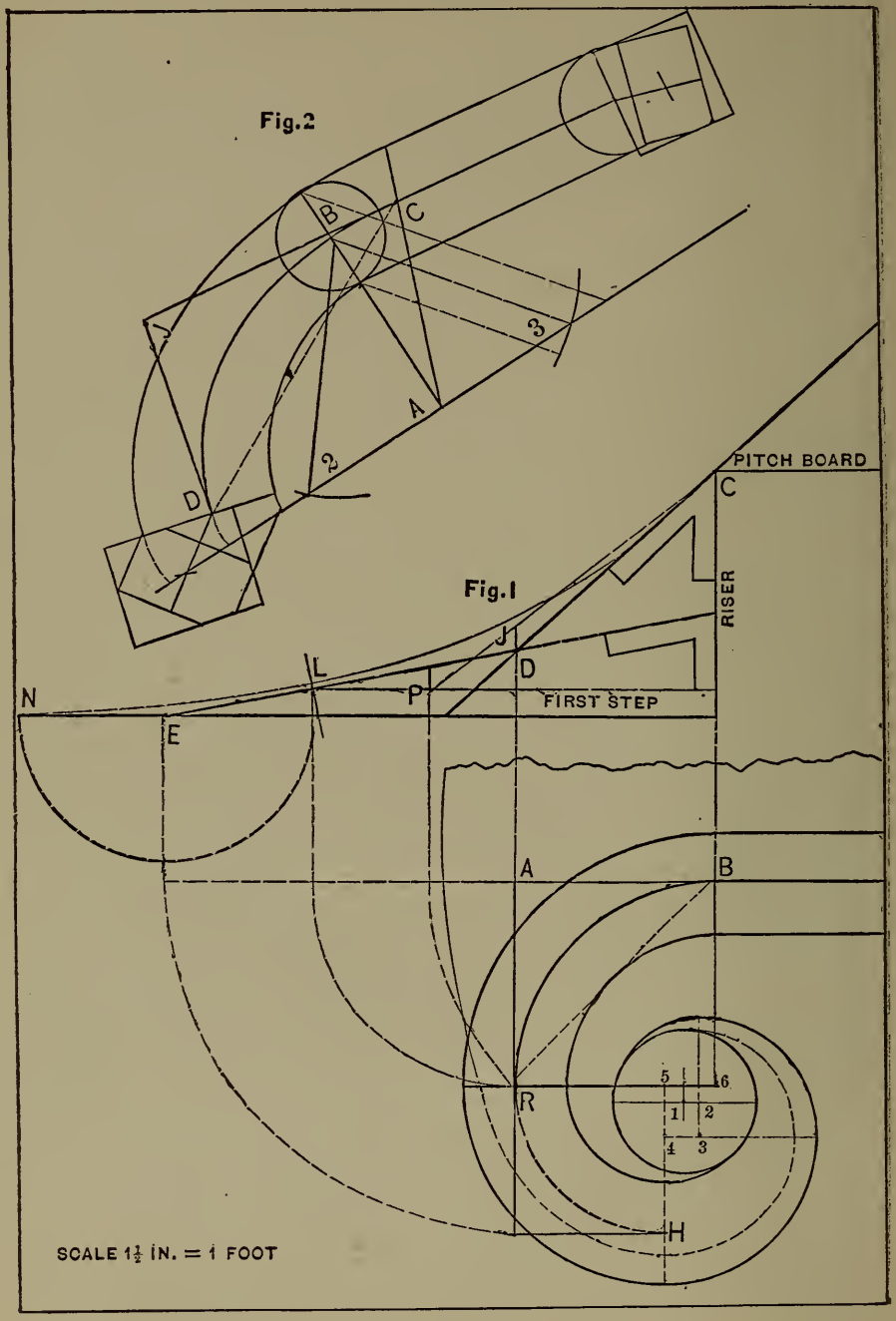
Fig.2
B
C
A
3
2
D
Fig.1
PITCH BOARD
C
RISER
J
D
L
N
P
FIRST STEP
E
A
B
5
6
R
1
2
4
3
H
SCALE 1½ IN. = 1 FOOT

PLATE XXVII

Exhibits the plan for a scroll at the starting of the stairs.

To draw the scroll : Describe the eye one inch wider than the rail ; divide the diameter into four equal parts ; subdivide, as shown by the figures, for the points to describe the curves.

To draw the elevation of the scroll : Square up from B to C ; draw the common pitch C D ; join D E.

To draw the mould, Fig. 2 : Square up from A to B equal A R, Fig. 1 ; from the point B as a centre, with C J, Fig. 1, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, by the use of thread or cord and pencil, describe the centre curve ; from the point A as a centre, with C D as a radius, describe an arc cutting the curve in C ; from the point C as a centre, with C P, Fig. 1, as a radius, describe an arc cutting the curve in D ; draw D J equal L D, and C J equal C D, Fig. 1 ; set off each way from B equal half the width of rail ; from the points describe the outside and inside curves.

To find the angles to bevel the plank for the wreath : Fit a piece to the angles of the tangents R A B, Fig. 1 ; draw the pitch L D on the side R A, the pitch D C on the side A B ; cut to the marks ; apply the bevel to the sides for the angles required.

Plate 28

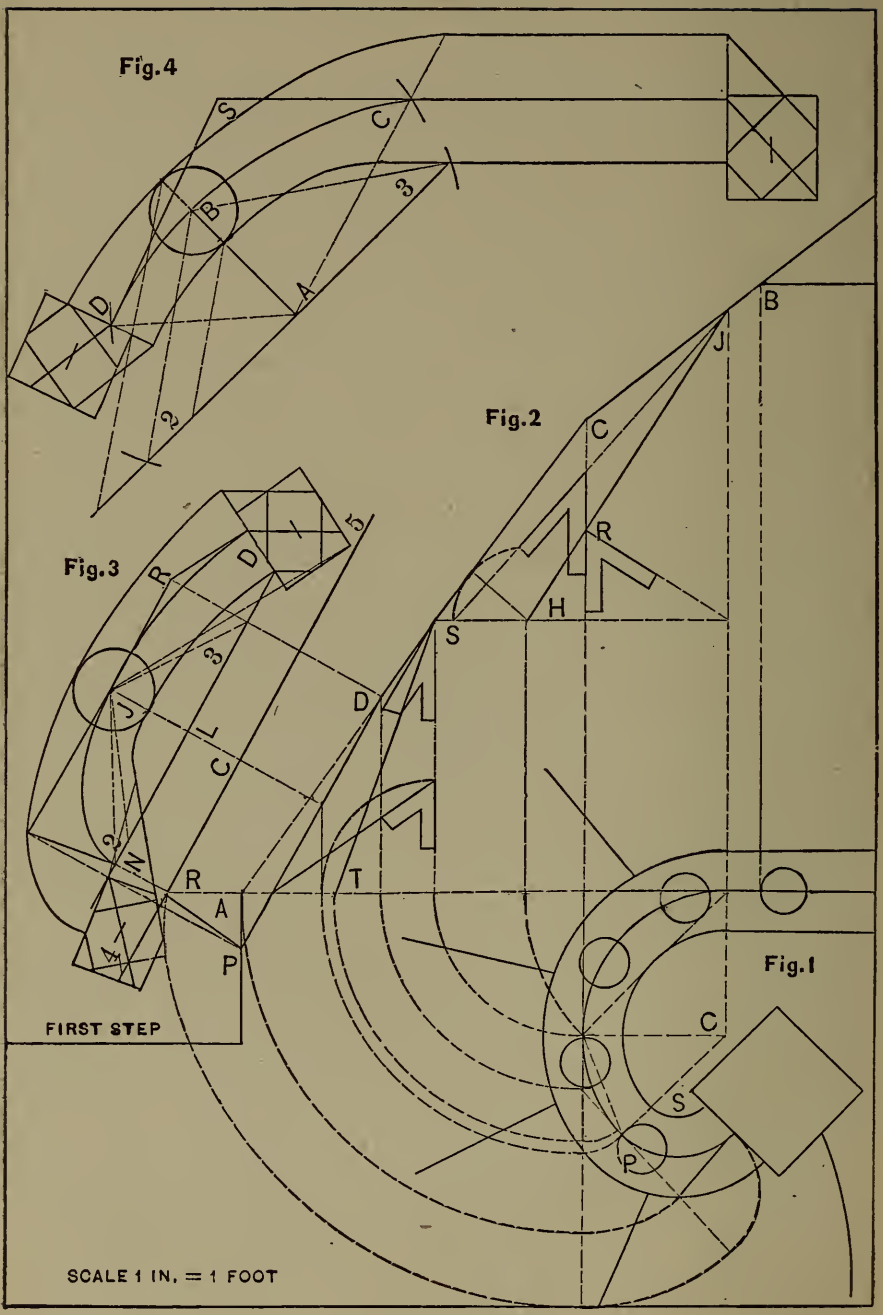

PLATE XXVIII

Exhibits a plan for half circle of winder at the starting, the curve drawn from centres of unequal radii.

To draw the elevation of the tangents : Set up from the step to A equal the difference in the heights of newel and short baluster, minus the rise of the common pitch from the riser to the point to bore for baluster ; also from the step to B equal five risers ; draw the common pitch B C ; at right angles to C A, draw R P, Fig. 1 ; join P D.

To draw the mould, Fig. 3 : Square up from the point C to L and J, equal C S and S P, Fig. 1 ; from the point J as a centre, with L N as a radius, describe arcs cutting the major axis in 2 and 3, the points for pins to describe the curve J N ; from the point J as a centre, with S T, Fig. 2, as a radius, describe arcs cutting the major axis in 4 and 5, the points for pins to describe the curve J D ; draw R D equal D S, Fig. 2 ; set off each way from J equal half the width of rail ; from the points describe the outside and inside curves.

To draw the mould, Fig. 4 : Square up from A to B equal C P, Fig. 1 ; from the point B as a centre, with J R, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3, the points for pins to describe the centre curve ; from the point A as a centre, with J C, Fig. 2, as a radius, describe an arc cutting the curve in D ; from the point D as a centre, with J H, Fig. 2, as a radius, describe an arc cutting the curve in C ; draw D S equal S C, and C S equal J C, Fig. 2 ; extend S C for the direction and length of straight rail ; set off each way from B equal half the width of rail ; from the points draw the outside and inside curves.

To find the angles to bevel the plank for the wreaths : Fit a piece to the angles of the tangents, Fig. 1 ; draw the pitches on the sides over which they are placed ; cut to the marks ; apply the bevel for the angles required.

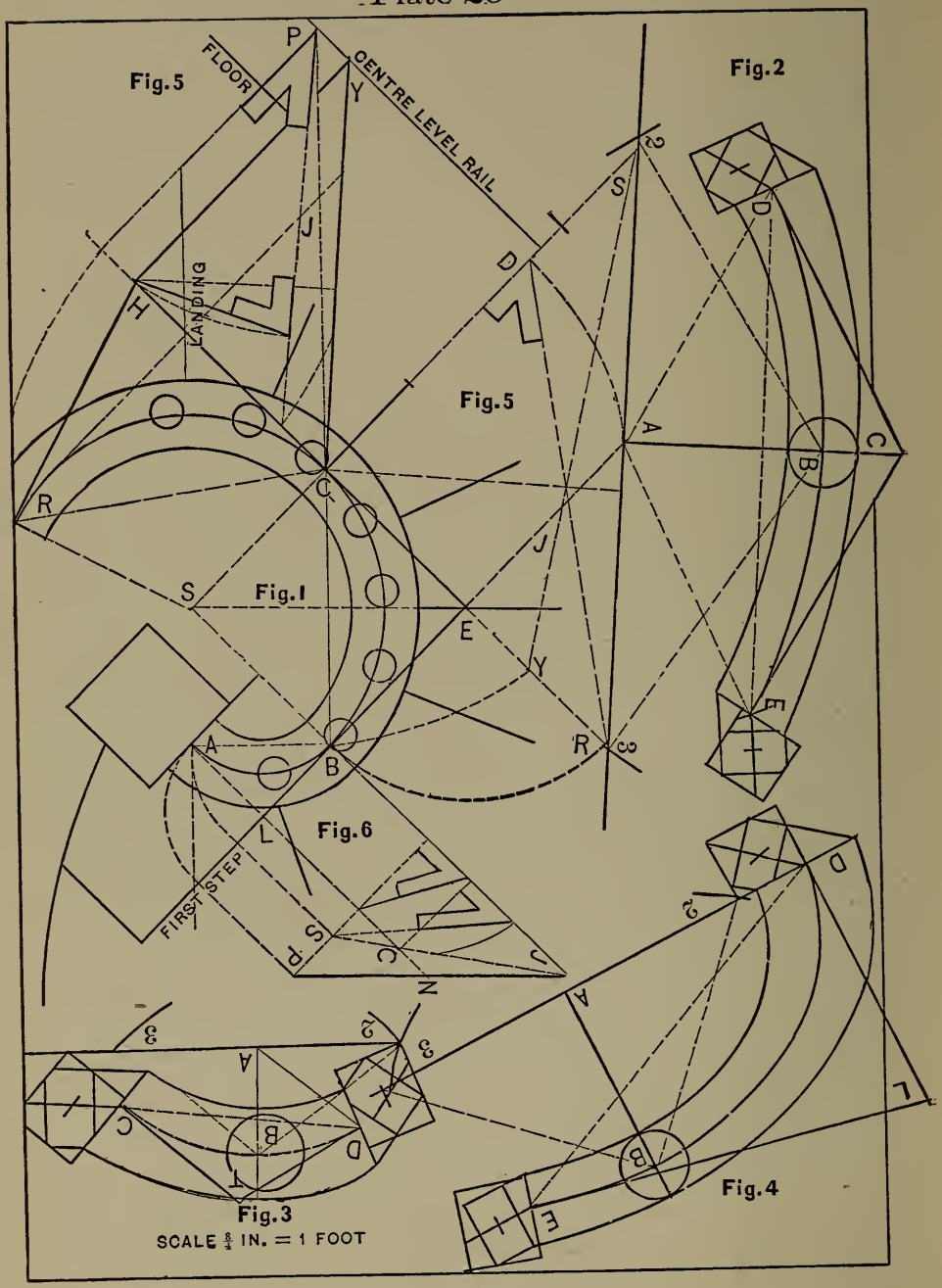
Fig.5
FLOOR
P
CENTRE LEVEL RAIL
Y
J
H
LANDING
Fig.2
D
S
2
Fig.5
A
B
C
R
Fig.1
E
Y
3
Fig.6
L
FIRST STEP
N
Fig.3
SCALE ⅜ IN. = 1 FOOT
Fig.4

PLATE XXIX

Exhibits a plan for circular stairs.

To find the common pitch : Square up from the tangent E C to S equal four risers ; join S R, the pitch required.

To draw the mould for the arc B C, Fig. 1 : Square up from A to C, Fig. 2, equal S E, Fig. 1 ; draw C D and C E equal S R bisected, and D E equal S Y ; set up from A to B equal S B, Fig. 1 ; from the point B as a centre, with S J as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, describe the centre curve ; set off each way from B half the width of rail ; from the points describe the outside and inside curves.

To draw the elevation of the tangents A L B, Fig. 1 : Square up from B to J, Fig. 6, equal three risers ; set up from first step to P, equal the difference in the heights of the newel and short baluster ; draw J N the common pitch ; join N P.

To draw the mould for the arc A B, Fig. 1 : Square up from A to B, Fig. 3, equal A L, Fig. 1 ; from the point B as a centre, with J C as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, describe the centre curve ; from the point A as a centre, with P N as a radius, describe an arc cutting the curve in D ; from the point D as a centre, with J S, Fig. 6, as a radius, describe an arc cutting the curve in C ; draw C T equal P C, and D T equal J N, Fig. 6 ; set off each way from B equal half the width of rail ; from the points describe the outside and inside curves.

To draw the elevation of the tangent C H, Fig. 1 : Set up from C to D equal two and one-half risers, plus the rise of

the common pitch from the riser to the point to bore for the baluster ; from the point D, square over for centre of level rail ; draw C Y the common pitch, Y H parallel to D C, and H R equal H C.

To draw the mould for the arc C R, Fig. 1 : Square up from A to B, Fig. 4, equal S C, Fig. 1 ; from the point B as a centre, with C J, Fig. 5, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, describe the centre curve ; from the point D as a centre, with C P, Fig. 5, as a radius, describe an arc cutting the curve in E ; draw D L equal H R, Fig. 1, and E L equal C Y, Fig. 5 ; set off each way from B equal half the width of rail ; from the points describe the outside and inside curves.

To find the angles to bevel the plank for the wreaths : Fit a piece to the tangents A L B, Fig. 1 ; draw the pitch N J on the side L B, the pitch N P on the side L A ; cut to the marks ; apply the bevel to the sides for the angles required.

Plate 30

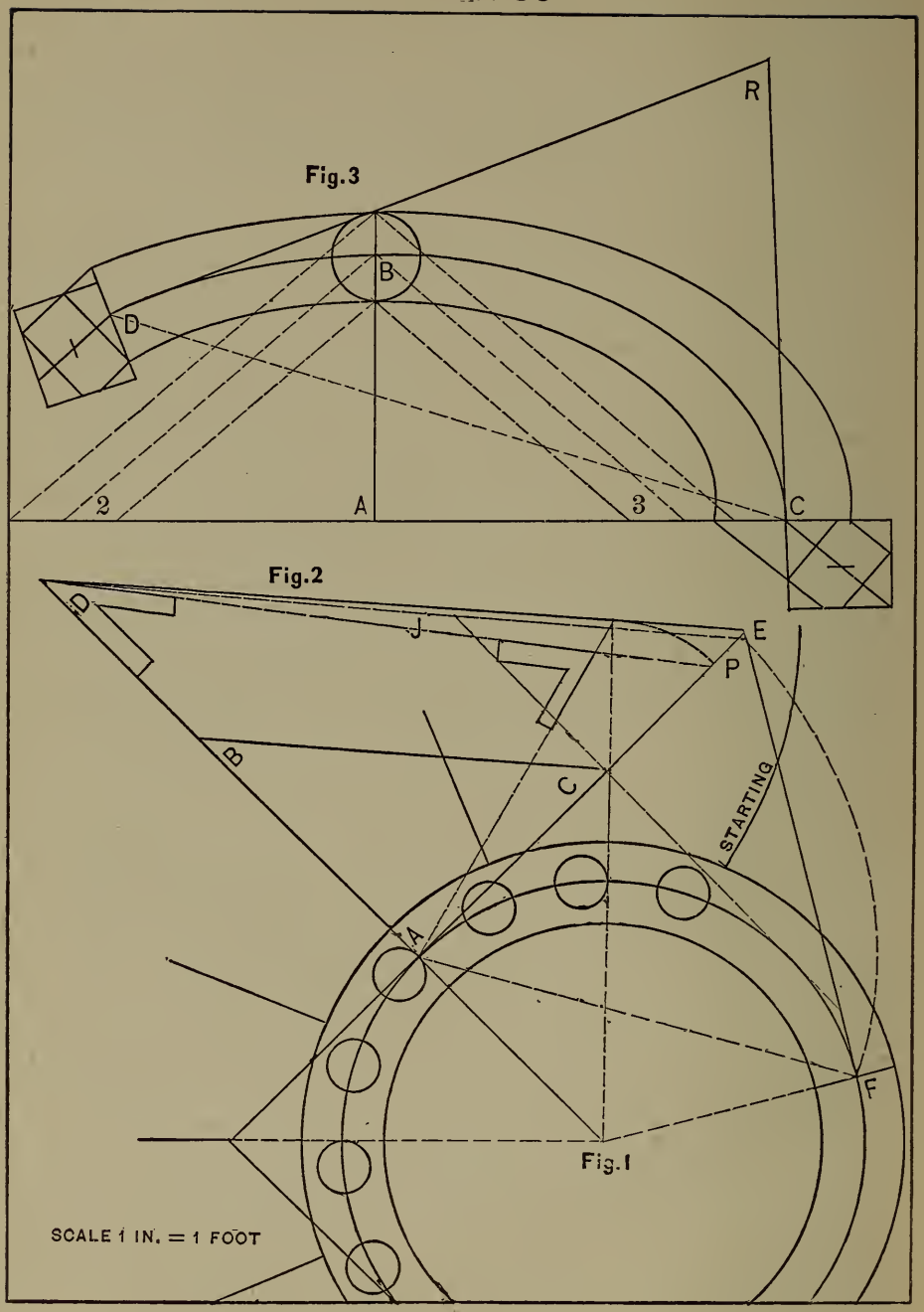

PLATE XXX

Exhibits the plan of circular stairs continued to the starting of second flight.

To find the common pitch : Square up from A to B equal two risers ; join B C the pitch required ; set up from A to D equal three and one-half risers ; draw D E parallel to B C, and the tangent E F equal E A ; then A F equals the length of curve required for the mould.

To draw the mould, Fig. 3 : Square up from A to B equal A C, Fig. 1 ; from the point B as a centre, with D J, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, and by the use of thread or cord and pencil, describe the centre curve ; from the point C as a centre, with P D, Fig. 2, as a radius, describe an arc cutting the curve in D ; draw D R equal D E, Fig. 2, and C R equal F E, Fig. 1 ; set off each way from B equal half the width of rail ; from the points describe the outside and inside curves ; cut the plank parallel to the centre curve, 3-16 wider than the rail ; the joints at right angles to the tangents and face of plank.

To find the angles to bevel the plank for the wreath : Fit a piece to the angle of the tangents A E F, Fig. 1 ; square over on the side E F ; draw the pitch E D on the side E A ; cut to the marks ; apply the bevel to the sides for the angles required.

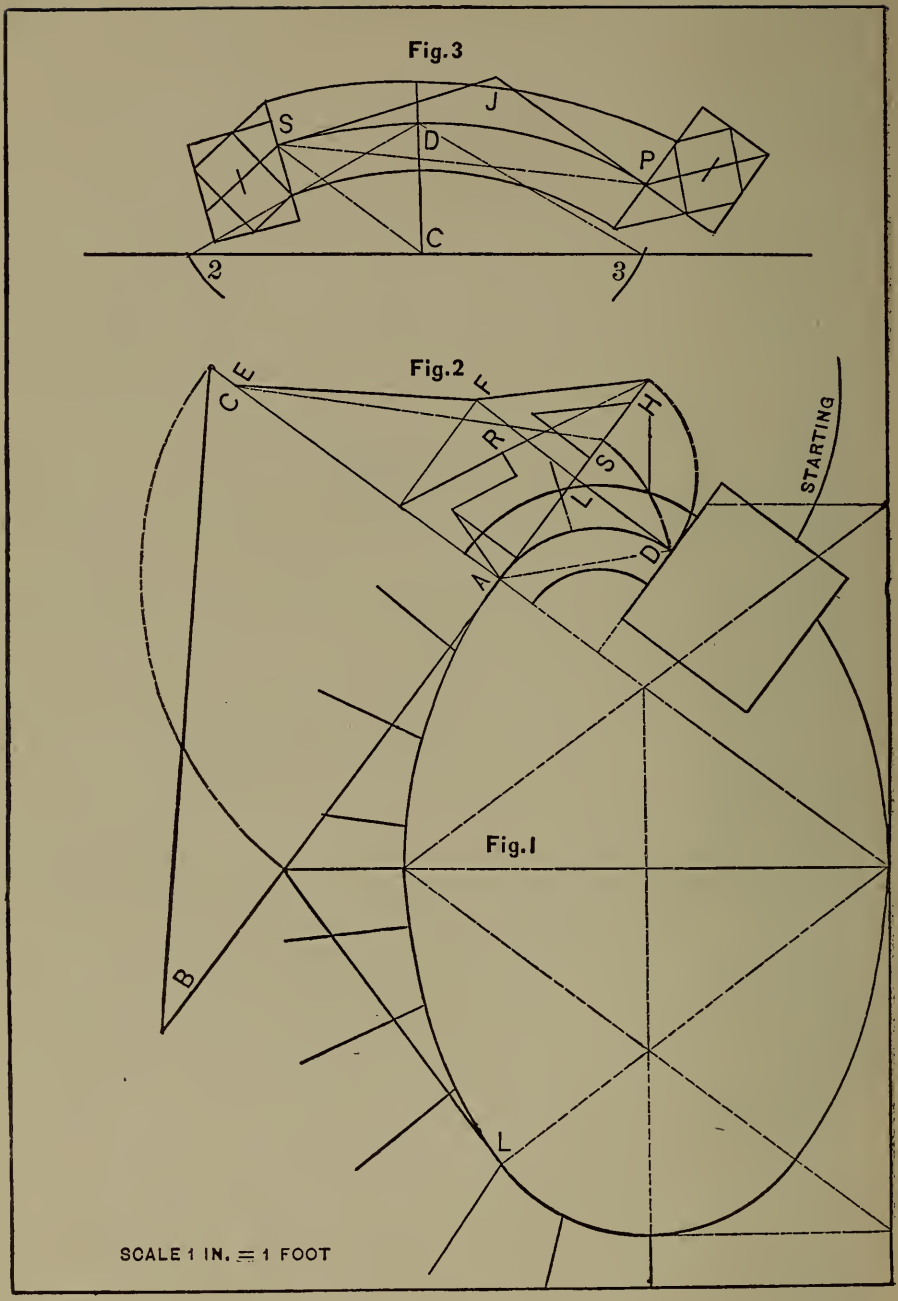
Fig.3
S
J
D
P
I
I
C
2
3
Fig.2
C
E
F
H
R
S
L
D
A
STARTING
Fig.1
B
L
SCALE 1 IN. = 1 FOOT

PLATE XXXI

Exhibits the plan of an irregular elliptical staircase.

To find the common pitch : Set up from A to B equal three and one-half risers ; join B C the pitch required.

To draw the elevation of the tangents D L A : Set up from A to E equal two risers ; draw E F the common pitch ; join F H.

To draw the mould, Fig. 3 : Square up from C to D equal D L, Fig. 1 ; from the point D as a centre, with E R, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, by the use of thread or cord and pencil, describe the centre curve ; from the point C as a centre, with H F, Fig. 2, as a radius, describe an arc cutting the curve in S ; from the point S as a centre, with E S, Fig. 2, as a radius, describe an arc cutting the curve in P ; from the points P and S as centres, with H F and E F, Fig. 2, as radii, describe arcs cutting each other in J ; set off each way from D equal half the width of rail ; from the points describe the outside and inside curves ; extend the wreath at P equal half the depth of rail.

To find the angles to bevel the plank for the wreath : Fit a piece to the angle of the tangents D L A, Fig. 1 ; draw the pitch H F on the side D L, and F E on the side L A ; cut to the marks ; apply the bevel to the sides for the angles required.

Plate 32

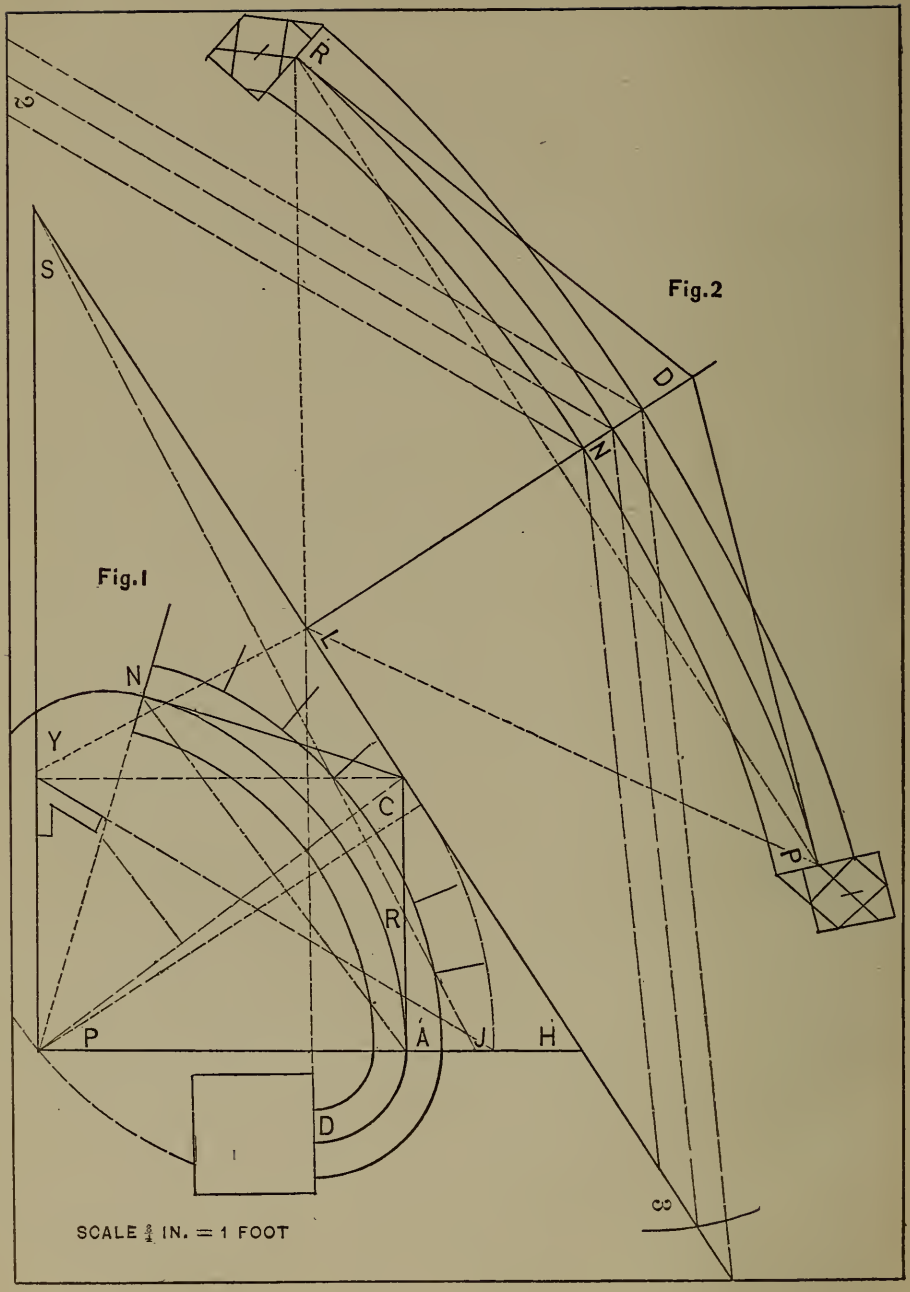

PLATE XXXII.

PLATE XXXI CONTINUED.

To find the elevation of the tangents A C N, Fig. 1, and the common pitch : Set off from P to H equal the tangents A C and N C ; square up from P to S equal seven risers ; join H S, the elevation and common pitch required.

To find the major axis of the elliptical curve for the centre of the mould : Set off from P to J equal A N ; join J S, cutting the tangent A C in R ; then S R equals half the length of major axis, and S J equals the length of curve required.

To draw the mould, Fig. 2 : Square up from L to D equal P C, Fig. 1 ; draw D R and D P equal H S bisected, and R P equal J S, Fig. 1 ; set up from L to N equal P A, Fig. 1 ; from the point N as a centre, with S R, Fig. 1, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, describe the centre curve ; set off each way from N equal half the width of rail ; from the points describe the outside and inside curves.

To find the angle to bevel the plank to form the wreath : Fit a piece to the angle of the tangents A C N, Fig. 1 ; draw the common pitch on the sides ; cut to the marks ; apply the bevel for the angle required.

Plate 33

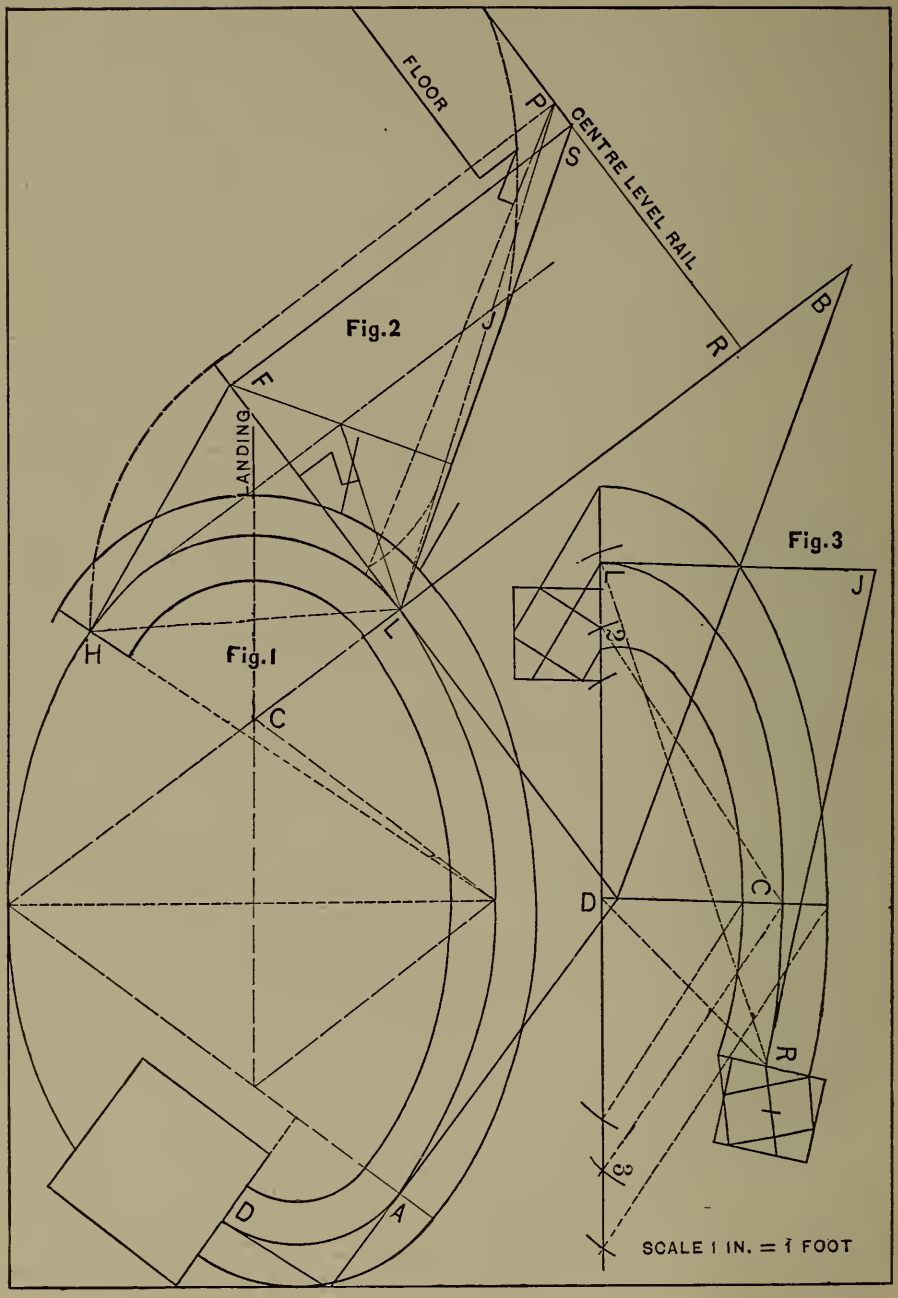
FLOOR
P
S
CENTRE LEVEL RAIL
R
B
Fig.2
J
F
LANDING
Fig.3
L
J
H
Fig.1
L
2
C
D
C
R
1
3
D
A
SCALE 1 IN. = 1 FOOT

PLATE XXXIII.

PLATE XXXII CONTINUED.

To draw the elevation of the tangent L F : Square up from L to B equal three and one-half risers ; join D B the common pitch ; set up from L to R equal two and one-half risers, plus the rise of the rail from the riser to the point to bore for the baluster ; square over for the centre of level rail ; draw L S parallel to D B, S F parallel to R L, and F H equal F L.

To draw the mould, Fig. 3 : Square up from D to C equal C L, Fig. 1 ; from the point C as a centre, with L J, Fig. 2, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, by the use of thread or cord and pencil, describe the centre curve ; from the point L as a centre, with L P, Fig. 2, as a radius, describe an arc cutting the curve in R ; draw R J equal L S, Fig. 2, and L J equal F H, Fig. 1 ; set off each way from C equal half the width of rail ; from the points describe the outside and inside curves.

To find the angles to bevel the plank for the wreath : Fit a piece to the angle of the tangents L F H ; square over on the side F H ; draw the pitch S L on the side F L ; cut to the marks ; apply the bevel to the sides for the angles required.

Plate 34

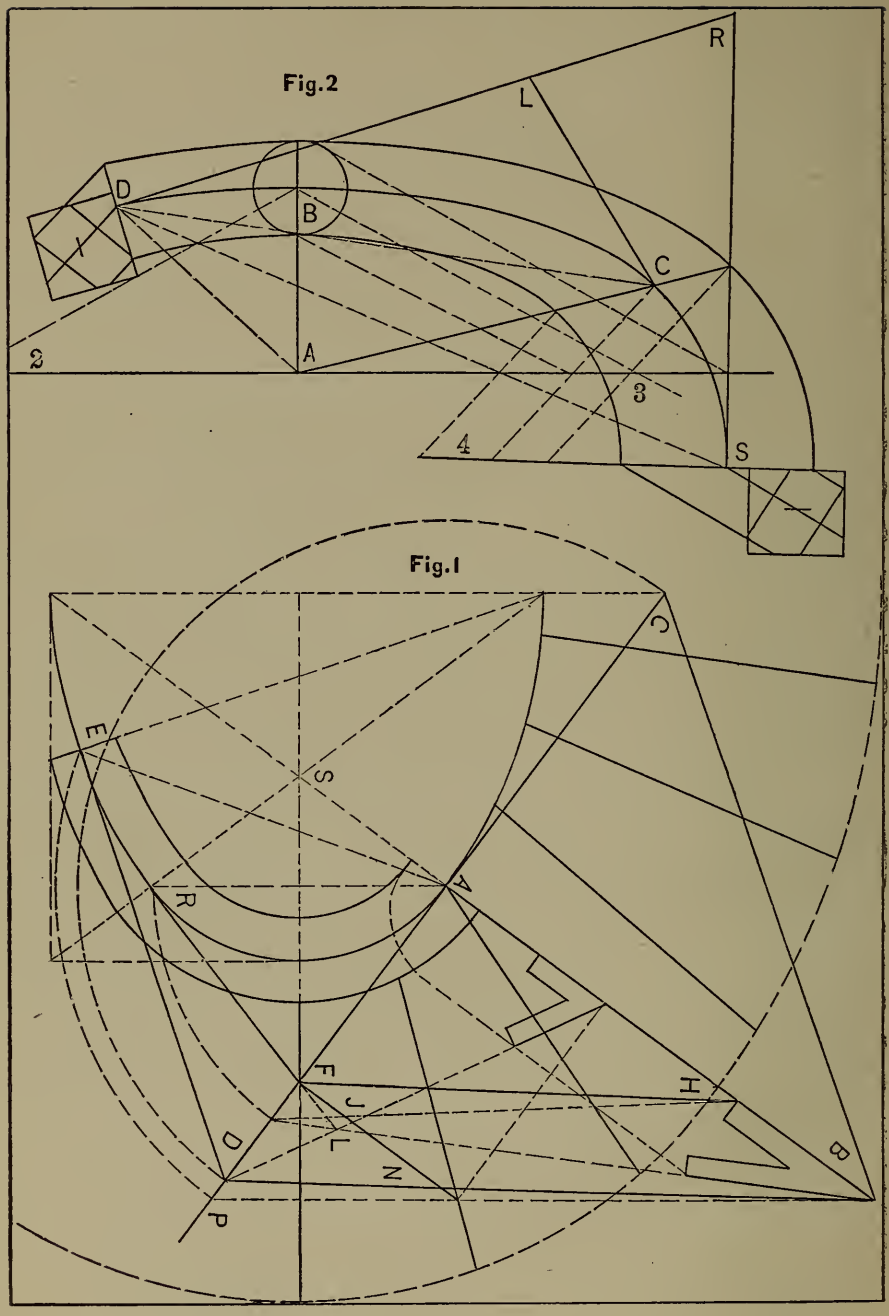

PLATE XXXIV

Exhibits the elliptical staircase continued to the starting of second flight.

To find the common pitch : Extend C A to D ; set up from A to B equal three and one-half risers ; join B D the pitch required ; draw D E tangent to the curve R E, F R tangent to the curve A R, F H parallel to D B, and F N at right angles to F A.

To draw the mould, Fig. 2 : Square up from A to B equal S A, Fig. 1 ; from the point B as a centre, with H J, Fig. 1, as a radius, describe arcs cutting the major axis in 2 and 3 ; with pins in the points, by the use of thread or cord and pencil, describe the centre curve ; from the point A as a centre, with F R, Fig. 1, as a radius, describe an arc cutting the curve in D ; from the point D as a centre, with B L, Fig. 1, as a radius, describe an arc cutting the curve in C ; from the points D and C as centres, with B N and R F, Fig. 1, as radii, describe arcs cutting each other in L ; extend D L to R equal N D, Fig. 1.

To extend the mould from the point R to E, Fig. 1 : From the points D and R as centres, with B P and E D, Fig. 1, as radii, describe arcs cutting each other in S ; join R S ; draw S 4 at right angles to S R, and C 4 at right angles to A D ; from the point 4 as a centre, describe the curve C S ; set off each way from B equal half the width of rail ; from the points describe the outside and inside curves.

To find the angles to bevel the plank for the wreath : Fit a piece to the angle of the tangents A D E, Fig. 1 ; square over on the side D E ; draw the pitch D B on the side D A; cut to the marks ; apply the bevel to the sides for the angles required.

Plate 35

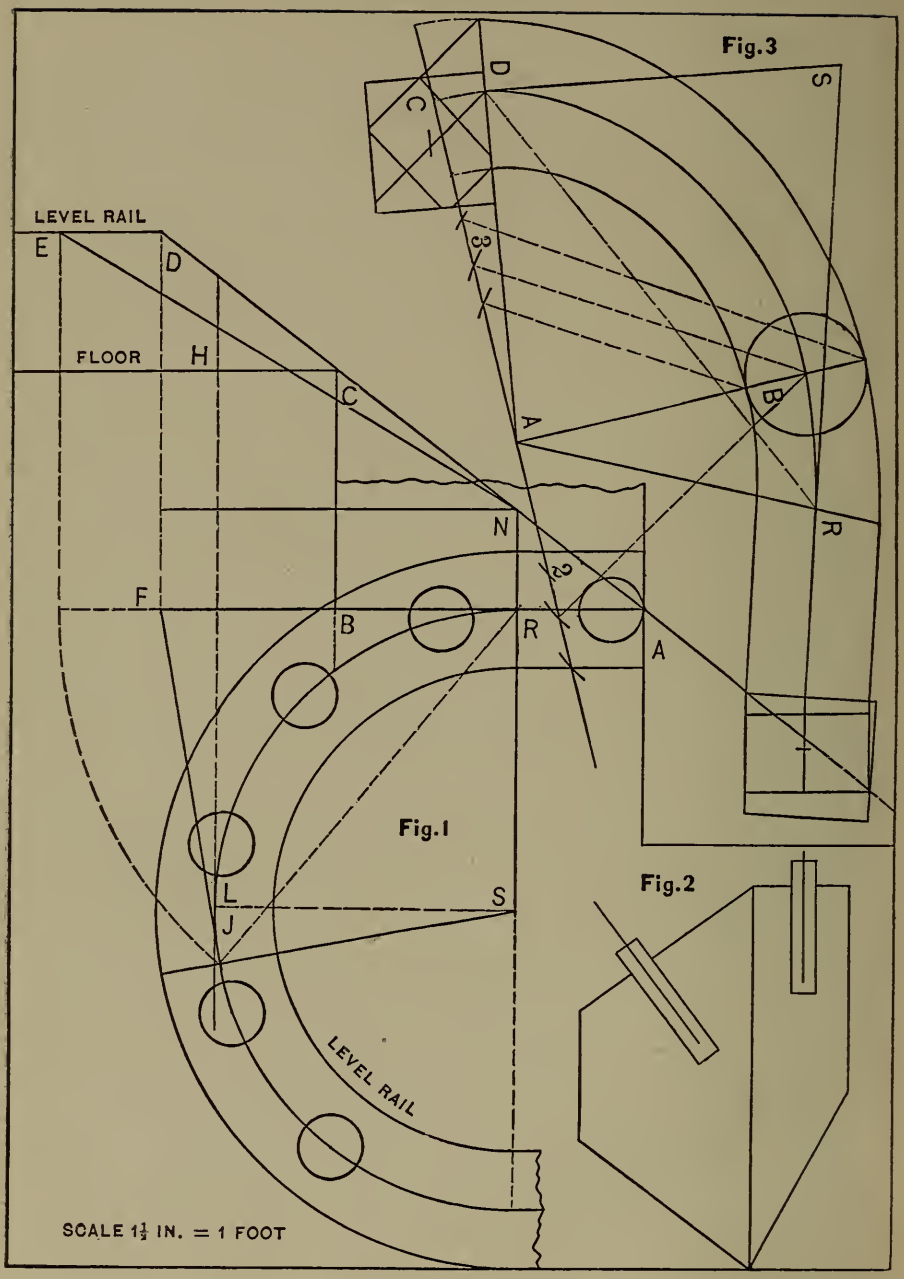
Fig.3
D
S
C
I
3
LEVEL RAIL
E
D
FLOOR
H
C
A
B
N
R
2
F
B
R
A
1
Fig.1
Fig.2
L
S
J
LEVEL RAIL
SCALE 1½ IN. = 1 FOOT

PLATE XXXV

Exhibits a plan of stairs at the landing.

To draw the elevation of the handrail : Place the step A B ; from the point A, draw the pitch A C and the floor ; set up from the floor to the centre of level rail, equal half the riser B C, and the rise of the rail from the riser to the point to bore for the baluster on the common pitch ; draw D F parallel to C B, and J S at right angles to J F ; then R J equals the length of curve required for the mould.

To find the angles to form the wreath : Fit a piece to the tangents R F and F J, Fig. 1 ; draw the pitch of the rail on the side R F ; square over on the side F J ; cut to the marks ; apply the bevel, as shown in Fig. 2.

To draw the mould, Fig. 3 : Square up from A to B equal S R, Fig. 1 ; set off from A to C, and from B to 2 and 3 equal N H ; place pins in the points 2 and 3, and by the use of a thread or cord and pencil, describe the centre curve.

To find the length of curve and point of contact : Set up from C to D equal L J, Fig. 1 ; set off from D to R equal N E, Fig. 1 ; square up from D to S equal J F, Fig. 1 ; join S R, and extend for the straight rail ; set off from B each way half the width of the rail ; the bevel applied to the width of the rail determines the width of the mould at D and R.

Plate 36

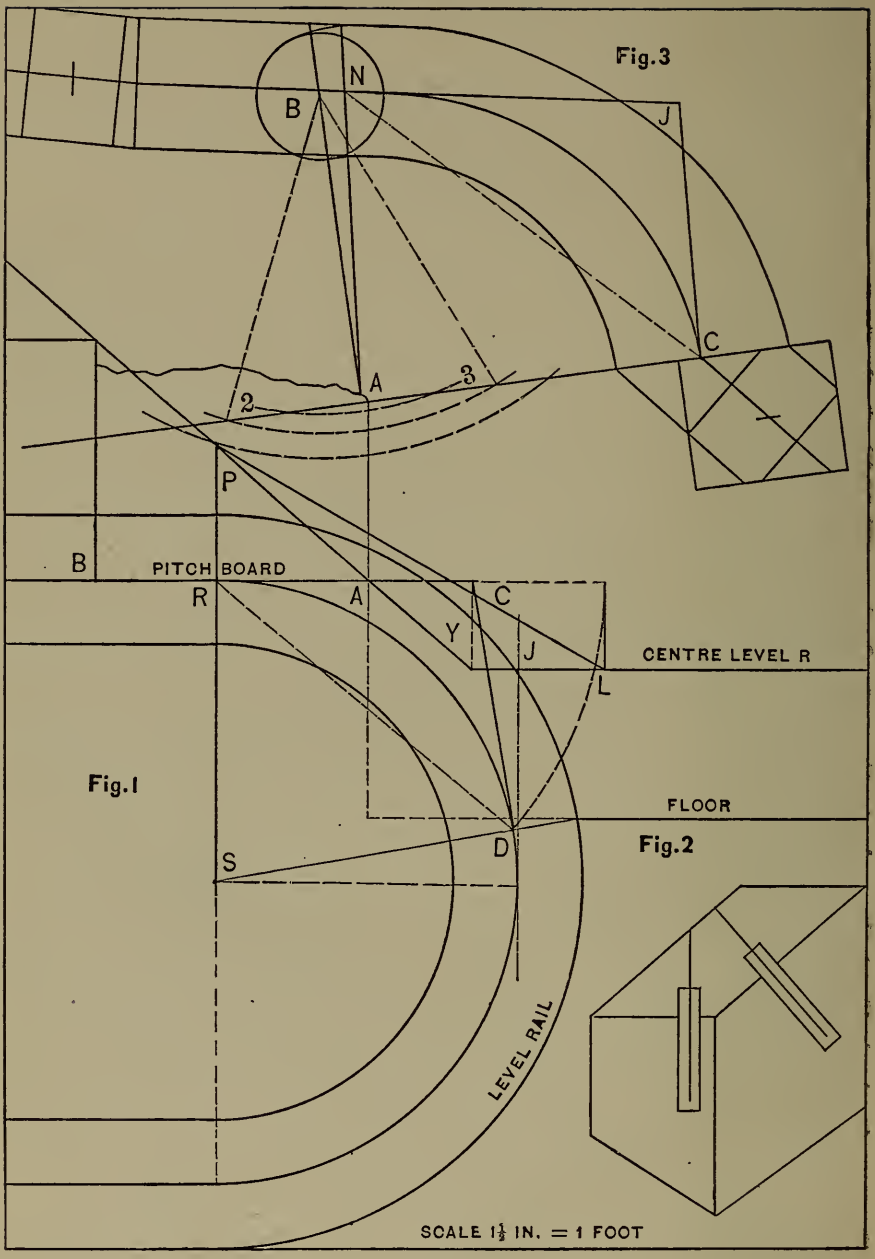
Fig.3
N
B
J
C
A
3
2
P
B
PITCH BOARD
R
A
C
Y
J
CENTRE LEVEL R
L
Fig.1
FLOOR
Fig.2
S
D
LEVEL RAIL
SCALE 1½ IN. = 1 FOOT

PLATE XXXVI

Exhibits a plan of stairs at the starting of second flight.

To draw the elevation of the handrail : Place the step A B ; set up from the floor to centre of level rail, equal half the riser, and the rise of the rail from the riser to the point to bore for the baluster ; square up from Y to C ; draw the tangent C D equal C R ; join D S at right angles to D C ; then R D equals the length of curve required for the mould.

To find the angles required to form the wreath : Fit a piece to the angle of the tangents R C and C D, Fig. 1 ; draw the pitch on the side C R ; square over on the side C D ; cut to the marks ; apply the bevel, as shown at Fig. 2.

To draw the mould, Fig. 3 : Square up from the point A to B equal S R, Fig. 1 ; set off from A to C, and from B to 2 and 3, equal P J, Fig. 1 ; place pins in the points 2 and 3, and by the use of the thread or cord and pencil, describe the centre curve.

To find the length and point of contact : From the point C as centre, with P L, Fig. 1, as radius, describe an arc cutting the curve in N, the point of contact and length required.

To find the direction of straight rail : draw C J equal C D, and N J equal P Y, Fig. 1 ; set off each way from B half the width of the rail ; the bevel applied to the width of the rail determines the width of the mould at C.